









**BRITAIN'S LEADING AIR POLLUTION JOURNAL**

# **CLEAN AIR**

*incorporating "Smokeless Air"*

**SPRING 1973**

**VOL. 3 NO. 9**

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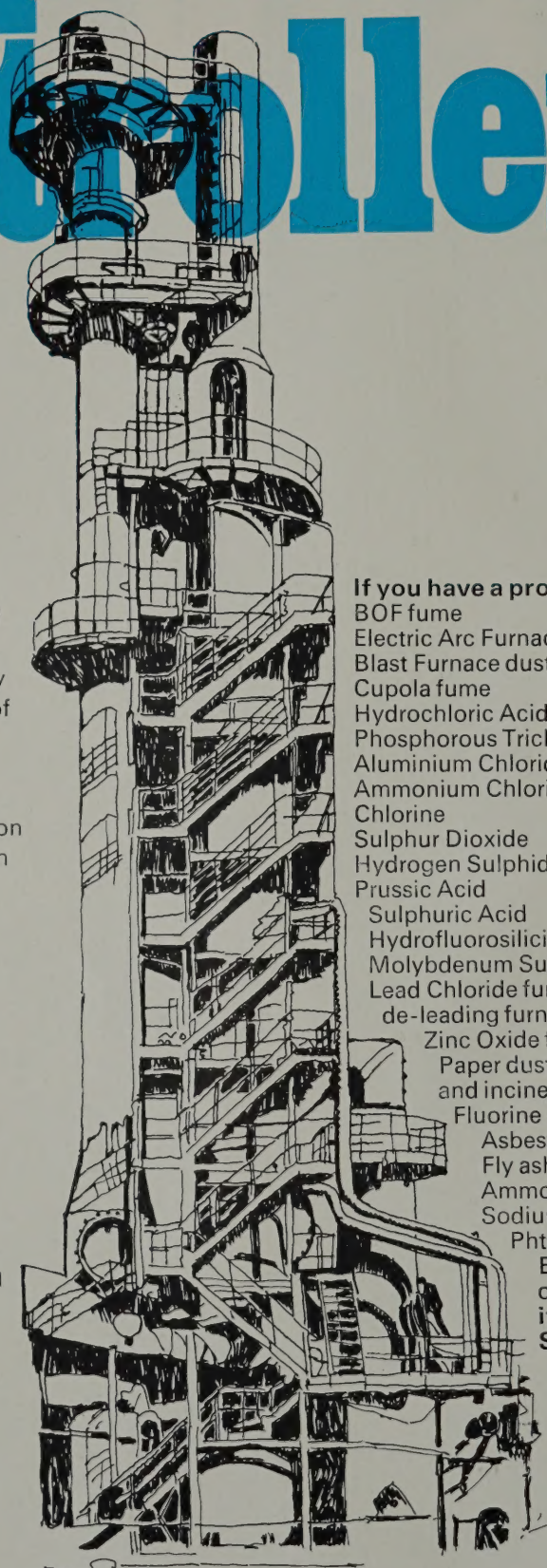
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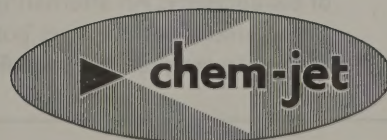
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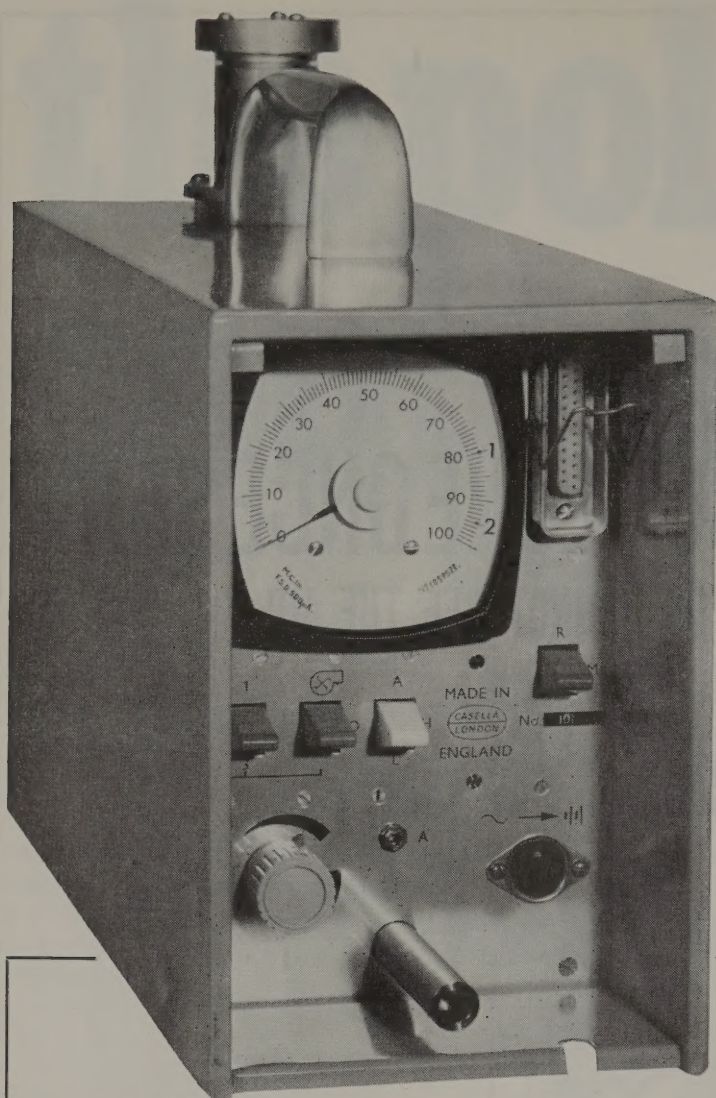
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# CLEAN AIR

## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

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Spring 1973

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### Erratum

The numbering of "Clean Air" published in Spring 1972 and Summer 1972 should be re-numbered as follows:

Spring 1972 Vol. 2 No. 5. Summer 1972 Vol. 2 No. 6.

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"This most excellent canopy, the air"

# CLEAN AIR

## Smoke Control Progress

In reply to a question in the House of Commons on the 5th February 1973, Mr Eldon Griffiths the Parliamentary Under Secretary of State of the Department of the Environment, said "There has been an excellent response to the Departmental circular of July 1971 urging local authorities to submit smoke control orders. The annual total of orders submitted during 1972 was 360, the largest ever; 50 per cent more than in 1971, and 7 per cent more than in the previous record year, 1967. These covered 148,000 acres in all—46,000 more than in 1967—and 492,000 premises—1,500 more than in 1967. Sixty six per cent of all premises in the "black" areas are now covered by orders. At this rate, complete coverage will be achieved before 1980."

This is indeed good news and reflects the rather cautious optimism which we expressed in the review of clean air progress in the recently issued 1973 Clean Air Year Book. But side by side with the encouragement given by the Circular of July 1971, the Society, through its Divisions in the field, also made an approach to all local authorities asking them to make greater efforts. We like to think that the Society has also played some part in this not inconsiderable achievement.

The figures given, however, are for "black" areas only. No mention is specifically made of progress in "white" areas, but we are pleased to report that progress has been made. But surely the time is fast approaching, if indeed it has not already come, when the designation "black" and "white" should be discontinued. It was in 1953 in the interim report published by the Beaver Committee that a map of England and Wales showing the main industrial areas of dense population and areas of high incidence of winter fog, was included. At that time it was reasonable to suppose that where these areas coincided, the need for cleaner air was greatest. On the basis of this map most of the local authorities of the great conurbations, together with certain others having similar smoke conditions, were classed as "black", that is to say as authorities whose areas stood in the greatest need of a vigorous policy of domestic smoke control. These included Greater London, Bristol, Cardiff and South Wales, Leicester, Coventry, Birmingham, Walsall and Wolverhampton, Nottingham, Derby, Stoke-on-Trent, Sheffield, Rotherham and Barnsley, Doncaster, Kingston-upon-Hull, Leeds, Bradford and Huddersfield, the Manchester and Liverpool conurbations, Burnley, Blackburn, Preston and the industrial areas of Tyne, Weir and Tees. But that was in 1956 and many of the authorities mentioned above are near to completing their smoke control programme—indeed some have already completed them. It should always be remembered that the "black" designation has at no time possessed statutory force. It has always been recognised that it was no more than a rough and ready indication of the areas of urgent need. Although the declared policy of successive governments since 1956 has been to press on with the completion of smoke control throughout the "black" areas, smoke control has also been encouraged when undertaken by "white" authorities.

The time has now come when activity in smoke control should be stepped up in the former "white" areas, otherwise they will find themselves becoming the black areas of the future. Figures published in the report of the National Survey already indicate that some of the former "black" areas are cleaner than places not so designated, some of them well known seaside resorts.

Statistics, though, are not everything. There is no doubt that in the last few years the country has been undergoing a form of social revolution and many householders are of their own free will converting to the use of smokeless fuels. Indeed, surveys in some of the former "black" areas have shown that up to 30 per cent of premises required no conversion. Surveys carried out in some "white" areas have shown that 50 per cent or more of premises are already converted. So some authorities could well find that the work is already half done and the expense in which they would be involved to finish the job would not be great. No one these days has any doubts about the benefit that smoke control has brought and is bringing to the country as a whole. The time has now come for the "white" areas to shake off any shades of grey and to be come truly pristine.

# EMISSIONS TO THE AIR

A report by D. E. Shillito

A selection of papers have been published in the March issue of the "Chemical Engineer".

A one-day symposium on Air Pollution Control in Works scheduled under the Alkali & Works Act and Orders, organised by London and South Eastern Branch of the Institution of Chemical Engineers was held at the Royal Aeronautical Society, London, on Thursday 9 November 1972, with about 180 participants.

The day was marred by the indisposition of the Chairman of the morning session, Dr. E. A. J. Mahler, C.B.E., H.M. Deputy Chief Alkali Inspector (Retired). Many of his friends and colleagues were looking forward to seeing him in action. Dr. D. B. Mulholland, the Branch Chairman, stepped ably into the breach and making apologies for his own lack of experience in this particular field, introduced the first speaker, Mr. M. Tunnicliffe, H.M. Deputy Chief Alkali and Clean Air Inspector of the Department of the Environment.

Mr. Tunnicliffe introduced his paper, "The Interpretation of Best Practicable Means," stating that Section 7 of the Act which covers the application of best practicable means (BPM) is too often misquoted. He therefore gave the full wording of Section 27 which deals with interpretation, pointing out that BPM must be applied to process supervision, operation and maintenance as well as to the provision of air pollution control equipment. To illustrate this point, Mr. Tunnicliffe said that where an incident was investigated the cause of the faulty emission was seldom a question of strictness of standards but more frequently resulted from failure in maintenance supervision or control. Unfortunately it is these failures and breakdowns that make news and consequently, with increasing public awareness, the Inspectorate requires industry to take a closer look at each of these points. Mr. Tunnicliffe pointed out that public health was the prime consideration of the Inspectorate, amenity problems were secondary and further that good public relations were becoming increasingly vital. The main theme of his paper was that BPM is not a set of requirements but is an essential part of the process, and a way of life.

The Chairman then introduced the second speaker, Dr. Watson, Manager, Engineering Research and Development, The A.P.C.M. Ltd. who with his co-author, Mr. P. A. Ward, A.P.C.M. Southern Area Office, presented a paper on "Best Practicable Means and the Cement Industry".

Dr. Watson first pointed out that the aim of the Cement Makers were those of the Inspectorate (not to lose cement). He showed several slides of process flow sheets, works and air cleaning equipment, explaining the philosophy behind the use of the different types of process equipment for raw materials, clinker and ground cement.

The session was then opened for questions from the floor, Mr. Ward joining the speakers on the stage.

In answer to a question on blobbing, Dr. Watson said that the mechanism of the structure of blobs was known. The fine particles in low concentration in the stack gases being agglomerated and bound together by condensed alkali salts. At the Northfleet Works of A.P.C.M. stack-burners are in use to maintain the stack temperature. Mr. Tunnicliffe acknowledged the extensive work of A.P.C.M. in this field and added that blobbing had been found at Power Stations burning pulverised fuel. A remark was made from the floor that the same phenomenon had occurred at the Magnesia works at Hartlepool during the war when 'snow flakes' were found to consist of  $Mg(OM)_2$  bound with NaCl. Questions were also asked on bag filters, electrostatic precipitators and atmospheric dispersion.

In answer to questions on the Common Market, Mr. Tunnicliffe said that the E.E.C. aim was for 'Common forms of Progress', and that the most successful techniques will converge as time passes on. The German Legislation, like the American, was proving complicated and achieved no better results than the simpler methods of the Inspectorate. Mr. Ward was also questioned about the emission of dust when clinker is loaded into ships, apparently an intractable problem. A question was asked on the purpose of sampling as a control measure and it was agreed that sampling had to be used sensibly, often it was possible to see if a device had broken down, but sometimes this was not so.

After the coffee break the third speaker, Mr. G. Speight of the British Steel Corporation presented his paper—"Best Practicable Means in the Iron and Steel Industry". Mr. Speight described the processes involved in an integrated steel works and continued to comment on some of the points mentioned in his paper. Taking the basic oxygen furnace as an example, he demonstrated the change in BPM over the 12 years the process has been in use to the present developments involving only dry electrostatic precipitators and production of a fuel gas. Mr. Speight also illustrated the corresponding developments with Arc furnaces and Sinter strands. The most significant pollution problem, however, was that of coke ovens where expenditure on air pollution control was 30-35 per cent of the total cost of the battery. On the steel side, Mr. Speight further stressed the need for containment of fumes within melting shops.

The fourth speaker, Mr. A. J. Clarke, Group Planning Department CEBG, presented his paper "Best Practicable Means of Reducing Emissions to the Air in the Electrical Power Industry". Mr. Clarke first indicated that air pollution control was big business, the CEBG were making a total investment of £1,000,000 per day and during the half-hour of the paper, £1,000 from that total would have been spent on air pollution control alone. Mr. Clarke confined the rest of his comments to stack heights and sulphur dioxide emissions. No practicable means were as yet available for the requisite removal of  $SO_2$  from stack gases. The CEBG

had been operating two plants at an efficiency of 90-95 per cent removal for 25 years but this was still considered insufficient. At the Battersea Station where  $\text{SO}_2$  removal had been discontinued close inspection of local  $\text{SO}_2$  gauges showed that there had been no change in ground level concentrations. If a case had to be made for the reduction of emissions of  $\text{SO}_2$  from power plant, it would have to be made on the basis of long range effects as background pollution over the country as a whole, rather than from local ground level concentrations.

In considering stack heights Mr. Clarke said that the three minute concentration period had limited value and that a time of between one hour and one day corresponded to the critical period. Calculations made for this critical period should not be mis-used as variations in both operating conditions and weather could give misleading results. For this reason the CEEB used calculations as only one of a number of considerations, the others being the present pollution load of the site and the potential for future development. Mr. Clarke said that he would prefer to see calculations used as an index of stack performance rather than yielding results in specific units such as  $\mu\text{g}/\text{m}^3$ . Before closing, Mr. Clarke posed the problems of alternative air pollution legislation to those of the Alkali Acts quoting some examples.

Because of the shortage of time the number of questions had to be restricted. Mr. Clarke was asked how oil-fired plant compared with coal-fired plant in terms of acid emissions, and if desulphurisation of fuel would be preferred to flue gas treatment for the reduction in  $\text{SO}_2$  emissions. Mr. Clarke explained that coal-fired plant gave rise to alkaline dust and that fuel desulphurisation would be preferred if any measure had to be adopted. In reply to a question on cooling towers he explained that there was no evidence that emissions gave rise to harmful effects, except of possibly, to visual amenity. In answer to a question on  $\text{SO}_2$ , Mr. Clarke reminded the delegates that it had got itself blamed for more pollution than it deserved because it was an easy to measure index of pollution. As our knowledge of  $\text{SO}_2$  increases, less and less could be said of its harmful effects.

After lunch at the Park Lane Hotel, Dr. L. E. Hockin, OBE, District Inspector (Retired) introduced from the Chair the first speaker for the Afternoon. Dr. David Train of the Cremer and Warner Partnership.

Dr. Train took his paper as read, concentrating on three non-technical points. Speaking as the Honorary Secretary of the Institution of Chemical Engineers, he made a plea for all engineers to look to their professional integrity especially where their everyday affairs could have an effect on environmental quality. Turning to process control, Dr. Train emphasised that limitations to progress were as much in management control as in technology and in this field BPM could be achieved independently of technology. Enlarging on Mr. Tunnicliffe's points of emissions occurring during emergencies, Dr. Train wanted to remind industry that it should be a management discipline to 'think out' the solution to a problem in advance, not to leave it until the start of the emergency.

Emergency drills should not only be planned but they should be tested and rehearsed regularly. Dr. Train concluded by explaining with the aid of slides the modifications he had introduced to the CEEB stack height and ground level concentration graphs.

The second paper of the Afternoon—"Petrochemical Works and the Alkali Act" by Dr. E. F. J. Tomalin and Mr. R. A. L. Davies, BP Chemicals International Ltd., was introduced. After discussing the effect of the 1971 Order on organic and petrochemical industries, Dr. Tomalin reiterated Mr. Tunnicliffe's point that the Alkali Inspectorate take an overall view rather than setting a limited set of enforceable standards. He considered the case for  $\text{SO}_2$  as a pollutant had been established in the field of corrosion in which it was the most important. With any pollutant the weak link in our knowledge was on the biological side, especially for hydrocarbon emissions from naphtha cracking plants. Control technology is known so the problems are basically those of economics. The notable exception in petrochemical plant being emergency flares which might have to combust hydrocarbons at rates up to the 10,000 lb/min requiring more steam than was available to control smoke. The problem with odours were in quantifying sources and special-purpose incinerators have been developed for the solution of disposal problems. Dr. Tomalin reported that the control system was flexible in allowing variations for the local environment and successfully achieve the aims of reducing emissions by co-operation rather than taking pride in the number of prosecutions achieved.

A question was asked why flares are necessary. Dr. Tomalin emphasised that it was due to the magnitude of the problem. If a suitable gas holder could be designed BP would try it. Vents are installed for personnel safety as much as for environmental protection. The question of the U.K. origins of  $\text{SO}_2$  pollution in Sweden was ventilated. Dr. Tomalin pointed out that industry should be entitled to use atmospheric dispersion for effluents provided that no environmental damage results. As for the problem in Sweden, Dr. Tomalin understood that they were now blaming the Ruhr and not U.K. Dr. Train added that it could only be for short periods at very infrequent intervals that weather conditions would permit  $\text{SO}_2$  from the U.K. to reach Sweden and he further emphasised that the sea was a good sink for  $\text{SO}_2$ .

Mr. Tunnicliffe returned to point out that it was the Inspectorate's job to protect the public and that no process that hazards the community would be tolerated. Mr. Clarke commented on the graphs produced by Dr. Train, the sensitivity of plants to  $\text{SO}_2$  was the best criterion to achieve. The figures quoted for ground level concentrations from power stations quoted by Dr. Train in his first graph were 50 per cent higher than those that Mr. Clarke would hope that the Alkali Inspector would accept. Dr. Train in reply gave credit to the CEEB's work on plume rise, dispersion and evaluation of ground level concentrations. A final questioner posed the point that inadequate research was being carried out on the development of instruments as compared with that of process control.

After tea, the final session was opened by Dr. F. J. Wagstaffe, Chairman of the ICI Clean Air Panel, who introduced the paper 'Best Practicable Means and the Production of Inorganic Chemicals'. Dr. Wagstaffe started by discussing the emission from ammonia soda process and, continuing with fertilizer manufacture mentioned that improvements at Billingham have led to a marked reduction in the incidence of Teesside Fog. When talking about the manufacture of acids, he mentioned that the additional capital expenditure required by the Alkali Inspectorate was higher than could be recovered in production. Dr. Wagstaffe discussed the problems involved with quarrying and handling of limestone by stat-

ing the magnitude of the scale of the problem, e.g. the 11 miles of conveyors in the ICI limestone quarries. Limestone and lime are very cheap commodities and emission control must be dependent on economics, steady progress is being made but there is still a long way to go. The problem of emissions of dark smoke from coal-fired lime kilns was also discussed. Dr. Wagstaffe closed by saying that in the absence of detailed knowledge of the efforts of air pollutants on ecology, the Alkali Inspectorate were forced to be strict and it was up to industry to make their contribution to the solving of environmental problems.

The final paper 'Control of Emissions from the Non-Ferrous Metals Industry' was introduced by Mr. E. C. Mantle, the Deputy Director of the British Non-Ferrous Metals Research Association. Mr. Mantle began by explaining that most of these industries in the U.K. were comprised of small secondary units of recovery and recycling which did not have the same problems as the large primary smelting industries overseas. The resulting pollutants were generally fine particulate oxides condensed from volatilised fume from fluxes and metals, finely divided carbon smoke from oil contaminated scrap and fumes from combustion of the insulation on scrap cable. All the normal forms of abatement equipment have been tried and the latest development in the form of the irrigated bag filter has good prospects.

Process modifications however are being made—cable insulation can be removed by embrittlement, smoke from oil contaminated scraps is being reduced by thermal de-oiling process and new lubricants are being developed, which are non-toxic and give no fume problem. Mr. Mantle also considered the aluminium industry and before closing his discussion said that the non-ferrous metals industry, essentially one of batch process was tending towards development of continuous processing which would lead to easier pollution control.

The discussion was opened. Dr. Wagstaffe was asked about emissions of mercury from chlorine plants. ICI had developed and regularly used detection instruments for mercury based on atomic absorption. Mr. Mantle mentioned that the 'fume sniffer' had been used for monitoring emissions of cadmium and mercury.

Dr. Wagstaffe was also asked why ICI were perpetuating the vertical shaft lime kiln, he replied that ICI had rotary kilns but they also had a large number of shaft kilns still viable, total replacement would be unjustifiable and far too expensive for a low cost product. A question was asked why new and uneconomic processes were being required for sulphuric acid manufacture when pollution requirement could be satisfactorily met by increasing stack height. The answer given was the BPM for abatement must be applied where it exists. On the subject of nitric acid Dr. Wagstaffe said that catalytic decomposition of tail gas had not proved to be the complete answer and tall stacks were still required. The policy of setting standards for pollution control and forcing industry to find answers had in the past proved unsatisfactory in giving rise to undesirable side affects. The best policies were based around finding the correct direction for process development before taking action on standards.

In answer to a question about the role of the Inspectorate in protecting industry from the planners Mr. Tunnicliffe explained that the authorities were being told to take account of industry, there had been on many occasions dialogues between the Inspectorate and the planners

Dr. Hockin brought the session to a close and Dr. Mulholland proposed the vote of thanks to the Speakers and Chairman.

## Pollution Control Congress 1973

5th—8th June 1973

Earls Court, London

This Congress will be held under the sponsorship of the Institution of Municipal Engineers, the Institute of Water Pollution Control, The Institution of Public Health Engineers, the Institution of Water Engineers, the Association of Public Health Inspectors and the National Society for Clean Air and will be held in conjunction with the Enpocon Exhibition organised by Brintex Exhibitions Ltd. The outline programme is as follows: The Congress will be opened on Tuesday morning by the Secretary of State for the Environment the Rt. Hon. Geoffrey Rippon, QC. The general subject of pollution will be discussed afterwards. Wednesday will be taken up by the problems of land protection and waste disposal. Thursday's subject will be the problems of waste and water reuse. Friday morning will be taken up by the subject of noise and in the afternoon air pollution will be discussed.



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# SIR HUGH BEAVER, K.B.E.

## 1890-1967

### THE FIRST

## SIR HUGH BEAVER MEMORIAL LECTURE

by

Sir Norman Kipping, G.C.M.G., K.B.E.

6th December 1972

*A series of three memorial lectures is being held to honour the memory of Sir Hugh Beaver, K.B.E., who died in 1967, aged 77.*

*The first was delivered by Sir Norman Kipping, G.C.M.G., K.B.E., who was Director General of the Federation of British Industries when Sir Hugh was its President.*

*The lectures are being sponsored by The Brewers' Society, The National Society for Clean Air and The Institution of Chemical Engineers, three of the organisations Sir Hugh Beaver had much to do with during his very active public life.*

This lecture is unusual in having multiple sponsors, reflecting the widespread feelings of admiration and respect for Hugh Eyre Campbell Beaver, the great man whose life and achievements are commemorated. I cannot enlarge on a technical theme that would be suitable to all the sponsors, so I will take a course which is extremely congenial to me, and talk about Sir Hugh Beaver himself.

#### Curriculum Vitae

Hugh Beaver was born in Johannesburg in 1890, and died at his home in Sussex in 1967. His father, who came from Montgomeryshire, died when Hugh was two years old, so the great influence of his childhood came from his wise and courageous Anglo-Irish mother. She returned from Johannesburg to England, nursed Hugh through a critical illness, and struggled with straitened circumstances.

At 13 years of age, Hugh won a scholarship to Wellington College in Berkshire where he started in the Lent term of 1904. By 1910, he had won the King's medal, was a scholar, a member of the XV and for his final year was Head Boy. In 1910 he tried for a major scholarship to Oxford, intending to become a barrister, but was unsuccessful. Wishing to become a contributor to family resources and not a drain on them, he decided against making a second attempt. Instead, he sat for the exam for entry to the Indian Police, and came out first.

#### The first job

So from the end of 1910 until 1922 he served in India, where his abilities resulted increasingly in his undertaking administrative and intelligence work. He tried twice to enlist in the British armed forces, but was prevented.

In 1922, a few months before his mother's death, Hugh returned home finally. He played with the idea even then of reading for the bar. His mother's home was at Penn Street, Bucks, and she had as neighbour Sir Alexander Gibb, the famous contractor and engineer.

#### A Switch to Engineering

So it happened that Gibb met young Beaver and saw in him a man after his own heart. At the age of 50, with his background as a contractor, Gibb was staging the audacious experiment of setting up as a consulting engineer in a new and modern mould, departing from the rigid and traditional practice of his Victorian rivals. Beaver was just the man to aid and abet him. At the same time, Gibb was recruiting his engineering team, but seeking a practice far wider than docks and harbours, railways, hydro-electric schemes and thermal power stations which were then the special field of consulting engineers. For besides these, he saw in the changing world the great growth of industries, and he set out to equip his firm to undertake the wide spread

of engineering problems of the modern factory—building and layout, heating and ventilation, chemical engineering, furnaces, power distribution and other specialist departments.

So Beaver was plunged into an engineering world, and—as one of his biographers has remarked—the speed with which he applied himself to assimilating the necessary knowledge of technicalities was to colleagues who had spent a lifetime mastering these subjects, little short of unnerving.

To this grasp and feeling for engineering, achieved at the cost of constant application and hard work, he added an administrative flair that had been developed in the Indian Police. And so, in this way, Beaver was involved in the planning and engineering of a number of major industrial developments, such as the Capper Pass Metallurgical Works and the Rothschild gold and silver refinery, and many others.

In 1925 he married his second cousin, Jean Atwood Beaver, by whom he had two daughters.

#### Achievements in Canada

In 1931, the Canadian Government wished to commission a National Ports Survey of Canada, which was to cover not only the technical and constructional problems, but also the organisation and administration of the national ports. Gibb dearly wanted to accept this very important commission, but other commitments made it impossible for him to free himself to lead it.

Beaver's comment was that a great deal could be got on with, in studying the organisation and administrative problems and making a start on the technical problems; then later on, when Gibb was free, he could join in on the big decisions which would by then have been identified. So Gibb appointed Beaver to take charge, with Angus Paton as his technical assistant. Gibb joined the team in Canada for two months.

While they were in Canada there was a disastrous fire at the Port of St. John, New Brunswick. The Canadian Government sent for Hugh Beaver, and commissioned him to get the port working again for the winter season, when the ports of Montreal and Quebec would be icebound. This was achieved, five berths being rebuilt in five months.

Thus Hugh Beaver had proved himself as the successful leader of a consulting team on a major national project. The report on the Canadian National Ports was published in 1932, and was later implemented.

### **Firmly established**

Returning home, Beaver was made secretary of the firm and, in 1932, a partner. They became deeply involved in a report for the Special Areas Commission. This was followed by a series of reports which were the foundation of the industrial estates which formed the basis of the Government's attack on the problems of the distressed areas; first in March, 1936, for the North Eastern area, then in July and August for Merthyr Tydfil and Treforest.

At almost the same time, the Dublin brewers, Arthur Guinness Sons and Company decided on the bold step of building a large brewery on the outskirts of London. It was a big project involving land acquisition, the planning and designing of every detail and the construction itself. Sir Alexander Gibb and Partners were appointed to carry this through, and Beaver was put in charge.

In 1935 he suffered the great grief of the death of his wife. He plunged into this great volume of work as an anodyne.

By chance, my first meeting with Beaver was connected with the Guinness project. Once the location of the new brewery at Park Royal had been settled, he decided with characteristic thoroughness to make contact with the men in charge of large factories in that part of outer London, to tap their experience on what might be called "community relationships" with local authorities, with suppliers of utilities, with labour and so on. I happened to be one of the men on his list.

Beaver's industrial experience was still further widened by other industrial commissions given to Alexander Gibb and Partners, including the A.B.C. Bakery, and further bakeries for the Weston group. In 1934, he had been made a member of the Institution of Chemical Engineers, and in 1940 (on reaching the age of 50) he was elected a member of the Institution of Civil Engineers. In both cases his election was under an "eminence clause."

As the threat of war loomed, it was to Beaver that the Government almost inevitably turned—first to design and commission three filling factories, and later to serve as Director General of the Ministry of Works.

### **Ministry of Works**

There are stories of Sir John Reith, when he was appointed Minister of Works in 1940, going round to Sir Alexander Gibb's office and refusing to budge until he had Beaver's acceptance. Those who remember John Reith and his almost hypnotic personality may not be surprised that a rather reluctant Beaver accepted. His responsibilities included the direction of the building and construction of the whole wartime programme of works and the supply of building materials; most assuredly a merciless task. No wartime knighthood can have been more deserved than his in 1942.

With the war at an end, Sir Hugh, like so many others, had to consider the question "What next?" He was then a man of 55. He was an automatic choice for appointment to the Reith New Towns Committee and to Stafford Cripps' Working Party on the Building Industry, but such appointments as these were not a career.

### **Joining Guinness**

As it turned out, Lord Iveagh provided the answer. As Chairman of Arthur Guinness, he had seen at close quarters the qualities that Beaver had displayed in carrying through his company's expansion. He, like Sir Alexander Gibb, had found him to be a man after his own heart. There is no doubt that C. J. Newbold had a big hand in this appointment. He was then Managing Director, and had worked very closely with Beaver throughout the Park Royal developments.

So in 1945, Beaver accepted appointment as Assistant Managing Director. He was very much regarded as Newbold's choice, and succeeded him as Managing Director when Newbold died suddenly in 1946.

From the evidence, it was about five years before Beaver felt he was on top of the Guinness problems. He

had introduced "modern management methods" inspired more effective research, introduced a policy of diversification, seen through a notable growth of exports, encouraged the development of young managers.

His pastimes included shooting, but even then his enquiring mind did not relax. Shooting a golden plover, he fell to wondering whether it was the fastest bird that flew. He insisted on finding out. Other people, he said, must have similar problems. And so was born the idea that has become the Guinness Book of Records, which at its 18th edition had printed more than 6 million copies; and the 19th edition is expected shortly.

There came a time when Beaver wanted to develop his ideas in a sphere wider than the single company and, in 1951 he began to do so, by accepting the Chairmanship of the British Institute of Management (which he stayed with until 1954) and the Deputy Chairmanship of the Colonial Development Corporation. A year later he was Chairman of the Committee on Power Station Development.

### **Wider Interests**

But these were not enough for a man of his restless energy. He was fortunate to be serving a company whose chairman believed—as he did himself—that it was a duty to bear a part, according to one's talents, in serving civilisation and our way of life. It was indeed on Lord Iveagh's nomination that Beaver joined the Governing Body of the Lister Institute of Preventive Medicine and continued as its Honorary Treasurer until 1966.

In 1953, he took on the Chairmanship of the Committee on Air Pollution. It became known as the Beaver Committee, and one can regard the award to him of the K.B.E. as a particular recognition of this work, for his recommendations became the basis of the Clean Air Act, 1956. Is there any other piece of amenity legislation in this century which has had such a beneficial influence on the environment?

The moment that task was done, Beaver became Chairman of the Advisory Council of D.S.I.R., which he held from 1954-56.

He took a particularly close interest in the Tavistock Institute of Human Relations. He was elected to its Council in 1956, and was its chairman from 1957 until 1966. He is remembered there as the man who saw through to success many of their boldest and most important plans for development.

Then came the Presidency of the Federation of British Industries from 1957 to 1959, and of the Institution of Chemical Engineers in 1957-58. Neither of these appointments is a sinecure; the former certainly was not, as I have every reason to know. 1957 and 1959 must have been the busiest years of his life, but somehow Hugh Beaver encompassed it all and revelled in it. It was during his F.B.I. Presidency that we went through the first big studies of the Treaty of Rome. I recall vividly the meticulous care with which Beaver conducted the Council meeting at which, after exhaustive enquiries, the reaction of British industry had to be determined; and also the meetings in Paris and Stockholm at which the talks were conducted which preceded the formation of E.F.T.A.—the “outer seven.”

While he was in the thick of all this and much more too, another request came out of the blue; and I must tell this story rather fully because it so well illustrates Hugh Beaver's qualities.

We were experiencing at that time a serious shortage of pure and applied scientists. Sir Alan Wilson, now the Chairman of the Glaxo Group and a Fellow of the Royal Society, believed that a contributory cause was the poor quality of science teaching in schools, and that this in its turn was connected with the inadequacy of their laboratory facilities, which in many cases had not been revised for many decades.

Sir Alan gathered round him three other industrialists, and between them in a couple of years they collected from industry the astonishing sum of £3½ million. They called this the Industrial Fund for the Advancement of Scientific Education in Schools. It was expressly to make capital grants to independent and direct grant boys' and girls' schools for building, expanding, modernising and equipping school laboratories. The administration of such a fund is no small task, involving, as it does, the inspection of each claimant and his plans, and the subsequent negotiations. It was to Beaver that the fund-raisers turned as Chairman of their executive committee. Between 1958 and 1963, he chaired 18 meetings of the executive and 32 meetings of its grants committee, and visited a large number of the 210 schools that received grants. It was a success story from start to finish.

Meanwhile to fill up his spare time, Beaver accepted, in 1958, the Chairmanship of Ashridge College, and of his old school, Wellington College,

of which he had been a member of Council since 1948. And still, of course, he was running Guinness until his so-called retirement in 1960, although he was joined as Joint Managing Director during his last year there by Viscount Boyd, who subsequently took over from him. Then, it may be, he found a little more time for his leisure pursuits. He loved his garden and his pictures. He was a keen amateur archaeologist, a voracious reader and a fine shot.

It gave Beaver enormous pleasure that his great contribution in so many spheres was recognised by the conferment of honorary degrees at various times by Cambridge, Trinity College, Dublin and the National University of Ireland.

But still there was no sitting back. He hated waste, particularly of brains, including his own. He undertook the treasurership of the University of Sussex, and the Chairmanship of the British Council for the Rehabilitation of the Disabled. Indeed his very active work in the Federation of British Industries continued long past his Presidency. I recount in my own book “Summing Up” the leading and formative part he played in 1960 and 1961 in the studies and discussions which led to the formation of Neddy—the National Economic Development Council. We then had a Beaver Committee of our own to aim not for clean air, but clear thinking!

### To summarise

So let us now recall in even barer outline, the features of Beaver's working life. A family background which had bequeathed a good brain, courage and determination. Twelve years in the Indian police, when he discovered a flair as an administrator, and ambitions to put his talents to work in a wider sphere. The coincidence of his meeting with Sir Alexander Gibb, and the fusion of the two personalities. Beaver's relentless hard work and his mastery of engineering problems. The Canadian National Ports, enabling Beaver to prove himself. The acknowledgement of this through his election as M.I.C.E., and as a partner in his firm.

The spread of the firm's business into the industrial field, including the Guinness Brewery. Its further spread into the distressed areas and the filling factories. Reith's success in securing Beaver as his war-time Director-General and his success in surmounting its relentless demands on his physique and his administrative talents.

Lord Iveagh's success in securing Beaver for Guinness's. His first five years there mastering its technologies

and reshaping the company to prosper in the fast changing world.

Then, progressively, the seizing of opportunities to apply his talents more widely. The B.I.M., the C.D.C. and the Beaver Committee on Air Pollution. The Advisory Council of the D.S.I.R., The Lister Institute and the Tavistock Institute, the Presidency of the F.B.I. and the Institution of Chemical Engineers, the huge amount of work he did for the Industrial Fund for the Advancement of Scientific Education in Schools, Ashridge College and later Sussex University, his lasting interest in the F.B.I. and his hand in the establishment of Neddy.

It is of interest to note that Beaver came into all his appointments from outside. But then I think it is characteristic of all great men that they can be plunged into any deep end, familiar or not, and emerge the stronger.

I wonder which of his many tasks Beaver would himself have regarded as his greatest achievement? I suspect he would have rejected the question put in those terms. Cost-benefit analyses are a doubtful proposition if, for example, you try to compare the improvement of science teaching in schools with the blessings of clean air. If instead the question were rephrased to ask what had given him the greatest inner satisfaction, I suspect that Beaver might have been persuaded to admit that it had been to apply his talents with all his might for the betterment of civilisation, and to encourage and help others to do the same according to their own strength.

### Reflections

Having now surveyed the bare historical facts of Hugh Beaver's life, there are four features which seem to invite some study in depth:

First, the relationship between a man's first job and his subsequent career.

Second, to remark upon the fact that a man most widely known for his work in the field of engineering was not himself a qualified engineer.

Third, to examine the effect on him of exposure to national as distinct from company affairs.

Fourth, to consider what we can learn from Hugh Beaver about the nature of leadership.

### First jobs

I turn to the first of my questions—the relationship between a man's first job and his subsequent career.

There are some men, I have no doubt, though not I think a majority, who have a vocation for a particular career from their early years. This can often be seen among talented

artists and musicians; but among more ordinary men it is specially, though not exclusively, seen among those who see service to mankind as a life work. The practice of medicine in some form, the Church, teaching, such occupations as the probation service—indeed public service in all its forms—fall into this category. I do not think that science or commerce or industry normally do so. I am uncertain about the legal profession.

But I do not see at all why vocation should be thought of as something which is revealed to a man in his youth, or not at all. In youth, the influence of parents and teachers and the need to earn a living must often be a dominant factor in the choice of first jobs. It is only when an intelligent man has been at work for a year or so that he emerges, so to speak, from the chrysalis and begins to realise his powers and formulate his ambitions. He is lucky indeed if he has a true friend who will help him with his weaknesses as well as his strengths.

So it seems to me that a vocation can emerge—and it looks as if it did so in Hugh Beaver's case—when a man is already mature. When he knows that he can take responsibility and wishes to do so; when he knows he can lead others and is accepted as a leader. It is then that the true quality of the inner man towers above a discipline, and provides the driving force to go any distance.

I think it is even worth speculating whether a training in a specialism may not postpone for a good many years—perhaps too many years—the time when a man in whom these qualities are latent is able to prove to himself and to others his ability to lead and to take big decisions. The reason is that he is tied to his specialism, and specialisms can too easily lead to dead ends. On the other hand, it can be argued that if Hugh Beaver's quality could shine through his background in the Indian Police, it would equally have done so had he had the training of a barrister, or indeed, of a specialist engineer. We cannot know, but my personal conclusion is that I am glad he had no specialism, and I think that second jobs matter a great deal more than first jobs.

### The Eminence Clause

Now I wish to give particular attention to Beaver's election as M.I.C.E. The Institution of Civil Engineers is the oldest (150 years or so) of the professional engineering institutions existing in the world. To-

day, with the technological explosion, they have proliferated to 15 chartered qualifying institutions who collaborate through the medium of the Council of Engineering Institutions (C.E.I.). These Institutions exist to advance their specialist technologies, to preserve professional standards, and in those ways to serve the community. Before, say, 1960, a great many engineers obtained their paper qualifications through on-the-job training supplemented by day or evening classes and the Higher National Certificate. Evidence of these and of practical experience under the supervision of members was accepted as a normal mode of entry to Associate Membership, with possible later promotion to full membership (or Fellowship).

Nevertheless, the Institutions used to permit two other forms of entry to Membership. One was by "Thesis", and as this is not relevant to the point I wish to make, I will not go into detail. The other was under some sort of an "eminence clause", and it was on this basis that Beaver became a member of the Institution of Chemical Engineers, and, a few years later, a member of the Institution of Civil Engineers—much cherished qualifications. He had most adequately demonstrated his ability to lead and control engineering teams in carrying out major programmes and projects. The fact that he had not a couple of years or so of classroom study behind him and had not passed exams to prove what he had learned as a specialist; the fact that he was not a practised draughtsman or designer, and would not have been able to make a designer's calculations—these were passed over, superseded by the unassailable evidence of what he had in fact done. To my mind, the Institutions were unquestionably right to judge him as a man who would be welcome in their ranks and maybe their councils, and who would add to their lustre.

Now it is common knowledge that the Institutions, both individually and through the C.E.I., are nowadays of a different mind, or are at least wavering over the continuance of anything like an "eminence clause" in their rules of entry. I understand that the argument goes something like this:

First, there has of late been a considerable revision in the terms of the Institutions' Royal Charters, so that their members are now entitled to describe themselves as Chartered Engineers. It is entirely proper that such a designation should carry with it a guarantee of minimum educational standards.

Secondly, it is argued that with

present-day ease of entry to the universities, there is no longer any need for men to "come up the hard way"; that if a man wants to get degree qualifications and has the ability, there is nothing to stop him doing so.

Third, there is some sort of a feeling that if a man could not bother with his professional institution in his earlier years, he should not be helped to find an "easy way in" in his later years.

And what about a man like Hugh Beaver? On the first point, I can see a possible objection to his using the title "chartered engineer". On the second point, it may well be that today, Beaver would have gone to the University and not to the Indian Police, in which case he would probably have ended up a barrister. On the third point, I just think it is wrong-headed. The matter should not be looked at purely in terms of the individual, but of the profession. It must surely be altogether advantageous for the professional institution to be enriched by the membership of a Hugh Beaver in its active ranks, serving, it may be, on its committees and perhaps taking office.

Such cases are in the nature of things small in number, but I think they are large in importance. I hope an acceptable way will be found of continuing with something like an "eminence clause," but maybe separating it from the description "Chartered Engineer." Such a clause should never be regarded as a backdoor entry, or as providing for second-class citizens. Rather it should be treated as a warm invitation to those who have displayed exceptional talent, whatever their academic qualifications may be. Perhaps "Honorary Member" would be appropriate, with its analogy to the award of honorary degrees and honorary fellowships.

It is interesting, in passing, to note that while the engineering institutions have been narrowing their entries to those with ever-stricter academic qualifications, the Royal Society have since 1962 been slightly liberalising theirs. They exist, according to their Charter, for improving natural knowledge and during this century until 1962 this led almost invariably to the election as fellows of pure scientists. Since 1962 this has been extended in a number of cases to those in industry who have led high-technology companies to new discoveries and great industrial achievements. Men, in fact, of the stamp of Hugh Beaver. As the specialist rises in industry, he becomes despecialised and generalised. Beaver was never really specialised. As an administrator, he never had the chance.

## Wider Horizons

And now for my third point, which is to ask what is the effect on a man of industrial or professional background, of being exposed at a high level to central administration. No doubt there are several present who have had this experience, as I did myself.

Is it just that any man aware of his talents has a natural ambition to play in the big league? Is it just that fame is the spur? Sometimes, it may be, this supplies the answer; but often it is not.

In an individual company or group, a man can develop and apply his own ideas, and even impose them. His rewards include the satisfaction of providing good employment, making export records, achieving growth and the prosperity of himself and his company and those who work in it. I do not, for one moment, decry these.

Working in central administration, a man comes to realise that his talents may be applied to influence or formulate policy on a national scale; that he may not only improve the performance of his own company in productivity, or exports, or research, or finance, but help all companies to do so by the planning of national incentives and policies. His horizons are immeasurably broadened; moreover, it is work not just for his own prosperity or advancement, but for the public good. There is a great wish in the hearts of many men to make a contribution of that kind. He can no longer just impose his ideas, he has to carry other people with him, or his ideas will not stick. He has to be more thorough in his preparations, more certain of his facts, more skilful in his advocacy. Small wonder then if the broader canvas and its challenges offer great attractions to a man of spirit and ability.

We can see this working out in Hugh Beaver, especially in his work for science teaching in schools and for research, his work on the Clean

Air Act, and his work for the F.B.I. He was able to feel in all these contexts that something real and lasting had been achieved, and at no personal advantage to himself. It was a contribution to civilisation and our way of life.

## The Puzzle of Leadership

The study of leadership has an age-long history, yet it remains a puzzle and a paradox. The wide bibliography of this fascinating subject reflects the depth of interest which it excites, rather than the completeness of our understanding of it. A life such as Hugh Beaver's gives us the opportunity to gain a little more insight.

I am grateful to Brian Smith for the study he gave to leadership in delivering the Hancock lecture to the Institution of Production Engineers in 1968. He reminded us of something Churchill wrote after the war: "In my long political experience I had held most of the great offices of State, but I readily admit that the post which had now fallen to me was the one I like best. Power for the sake of lord-ing it over one's fellow creatures or adding to personal pomp is rightly judged as base. But power in a national crisis, when a man believes he knows what orders should be given, is a blessing."

There, put with great clarity, is the difference between the wrong sort and the right sort of ambition. There can be no doubt, I think, that Beaver was ambitious, but wholly with the right motives. A leader has to be aware—or to become aware—that he knows the right objectives to aim for, and the right orders to give.

It is, I think, extremely rare for acknowledged leadership in big affairs to be seen in men under 30 years or more of age. This is because a leader soon understands that he must acquire a comprehension of the problems of those being led. There is abundant evidence that Beaver found this out early in life and practised it to his

dying day. In fact no one should think that a position of great leadership can be easily attained, for men will not follow unless they have confidence and faith that their leader will win. His position as leader, in other words, has to be earned. His personality and energy and toughness, his humour and humanity, his ability to communicate and to simplify, may give him a start, but it is proven demonstration of success that puts the seal on his right to lead.

We can see this progression with great clarity in Beaver's life. It seems to me that the moment of proof was his performance in Canada in 1931-32, when he was just over 40.

Beaver was a generalist rather than a specialist. I should hesitate to say that a specialist cannot become a great leader, though I think he is at a disadvantage.

Should we see leadership as a part of management—something which can be taught and self-consciously applied like a technology? I find it far easier to see management as a part of leadership. If it is true that a leader must acquire a comprehension of the problems of those to be led, then these certainly include the problems of management. But I shall go to my grave believing that leadership cannot be taught, though I believe that those who possess the divine spark can learn to make it even brighter. For example, is it a skill of leadership, or of management, in judging objectives which are just attainable?

I somehow think that because of his essential modesty it would at first amaze Hugh Beaver to know that lectures were to be given in his memory. As a second reaction he would be deeply and quietly moved to know that his life of work was felt to have lasting values, and that he had inspired so much affection.

He was one of the very great men of his day. I know myself to be very privileged in giving this first lecture.

# VISIBILITY AND SUNSHINE IN GREATER MANCHESTER

by

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## Visibility

'Fog' is defined as being associated with visibility less than 1000m. A 'dense' fog is one with visibility less than 40m, and occurs only infrequently. 'Thick' fog results in visibility less than 200m, and is more common. Another visibility class in frequent use is less than 400m. The average number of days during 1960-69 at Manchester Airport and Rochdale with visibility at 0900 GMT in the fog categories was as follows<sup>1</sup>:

Station Altitude		Visibility below:			
		40m	200m	400m	1000m
Manchester Airport	76m	0.6	6.3	7.4	15.8
Rochdale	111m	2.3	9.5	16.8	26.0

Up to altitude of about 150m fog is largely a result of cooling by radiation, especially during winter nights, and topography has a greater effect than altitude on its formation. Thus the Rochdale station, situated on a valley floor, has a high frequency of fog (though smoke pollution is undoubtedly a contributory factor) whereas other stations at similar altitudes outside the conurbation have lower frequencies. There are considerable variations in the incidence of fog from year to year. Generally, however, frequencies increase through the autumn and early winter to a January peak, and then decline. During most months, the greatest fog frequencies occur within an hour or two of sunrise.

substantial fall in smoke concentrations by 1963, the numbers of dense and thick fogs showed a marked decrease by that year. Large reductions in the frequency of less thick fogs at Heathrow were observed during the period 1947-63<sup>4</sup> (not shown), while reductions in the numbers of dense and thick fogs were small. Percentage changes are greater over the 1955-1969 period, when control was more extensive.

Studies in Yorkshire and Glasgow tend to confirm the considerable improvement in visibility as the Clean Air Act 1956 has been progressively implemented.<sup>2</sup> There has in fact been a general decline in fog frequencies at urban and rural sites throughout the U.K., and though a considerable part of this reduction may be attributable to smoke control, results at particular stations need to be examined against this general background.<sup>5</sup>

## Visibility and Pollution in Manchester

Published evaluations of visibility changes are available. Table 2 is taken from one such reference<sup>6</sup>, and gives percentages representing the probability of visibility at the Airport during various periods being within certain ranges according to wind speed. Allowance is thus made for varying windiness from one period to another; the main meteorological factor involved. It will be observed that each percentage for the years 1960-64 is lower than the corresponding percentages for other periods,

TABLE 1: AVERAGE ANNUAL NUMBER OF HOURS OF DENSE AND THICK FOG IN LONDON, 1947-69

		Number of Hours of Fog			Percentage Decrease		
		1947-54	1955-62	1962-69	47-54 to 55-62	55-62 to 63-69	47-54 to 63
Dense	Kingsway	27	13	2	52	85	93
	Heathrow	57	54	18	5	67	69
	Kew	95	73	—	23	—	—
Thick	Kingsway	68	52	15	24	71	78
	Heathrow	202	177	83	12	53	59
	Kew	241	189	—	22	—	—

## Visibility and Pollution

There is considerable evidence to suggest that fogs associated with visibilities of less than 400m are water fogs, with smoke having some contributory effect. Fogs in the visibility range 400-1000m are chiefly due to smoke, however<sup>4</sup>. Small reductions in smoke concentrations would thus be expected to reduce the frequency of less dense fogs rather more than the frequency of thicker fogs. As larger reductions in smoke concentrations take place, so a fall in the number of thick and dense fogs would be expected. Table 1<sup>2</sup> lends some support to this argument. In London, where smoke control around Kingsway was commenced first, leading to a

especially 1955-1959. Light winds thus become less likely to be accompanied by low visibility than previously, even in the poorer visibility ranges. Although these results indicate a significant improvement in visibility certain important factors have been ignored (e.g. changes from period to period in the way light winds were distributed with respect to wind direction, month and time of day).

These same factors have been ignored in a comparison of fogs at the Airport and at the Weather Centre.<sup>7</sup> During the 1960s, the Weather Centre had approximately twice as many fogs with visibility less than 1000m than did the Airport at 0900 GMT (Table 3)<sup>7</sup>. On the other hand,

**TABLE 2: POOR VISIBILITY AT MANCHESTER/RINGWAY AIRPORT DURING THE WINTER HALF-YEAR: FREQUENCIES EXPRESSED AS PERCENTAGES OF OBSERVATIONS FOR EACH RANGE OF WIND SPEEDS**

		Range of Wind Speed (knots)			
		0	1-3	4-6	7-10
Period (1949-54)	Number of Observations in Speed Range	1969	1671	3920	8217
	Percentages with Visibility Less than: 220 yards	16	8	3	0.4
	440 "	21	11	4	0.5
	1100 "	41	26	11	3
	2200 "	68	52	35	13
Period (1955-59)	Number of Observations in Speed Range	1319	1599	2660	6848
	Percentages with Visibility Less than: 220 yards	20	12	3	0.8
	440 "	28	16	6	1
	1100 "	51	32	15	4
	2200 "	71	54	36	14
Period (1960-64)	Number of Observations in Speed Range	2460	1651	3777	5836
	Percentages with Visibility Less than: 220 yards	14	6	1	0.1
	440 "	19	8	2	0.3
	1100 "	38	20	9	2
	2200 "	61	40	25	8

thicker fogs (visibility less than 500m) are slightly more prevalent at the Airport than at the Weather Centre (Table 4)<sup>7</sup> and dense fogs occur much more frequently at the Airport.<sup>8</sup> The meteorological reason for this phenomenon is the tendency of a wind to set up in winter calm weather, preventing the persistence of fogs in the city, although dense fogs may remain in the west and south.<sup>8</sup> Another factor is the effect of valley formed thick fogs on the Airport, whereas the heat island created by the city probably reduces the incidence of dense fogs at the Weather Centre.

Using earlier data for the Airport,<sup>7</sup> it can be shown that the average number of winter days on which fog (visibility <1000m) occurred was considerably greater during the years 1955-60 than during 1961-68. The percentage changes are shown in Table 5,<sup>7</sup> where changes in the very small summer frequencies have been ignored as not being meaningful. Table 6,<sup>1</sup> which shows the percentages of hourly observations with visibility less than specified values at Manchester Airport during 1959-68, can also be used to demonstrate an improvement in visibility during the last decade.

**TABLE 3: NUMBER OF DAYS PER MONTH WITH FOG AT 0900 GMT (VISIBILITY < 1000 m)**

## (i) Manchester Airport

Month	1961	1962	1963	1964	1965	1966	1967	1968	Monthly totals	Monthly averages
January	3	5	5	0	5	0	3	2	23	2.9
February	0	0	0	2	1	0	3	4	10	1.3
March	2	1	1	1	0	0	0	0	5	0.6
April	1	0	1	1	2	0	1	0	6	0.8
May	0	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0	0
July	1	0	0	0	0	0	0	0	1	0.1
August	0	0	0	0	0	0	1	0	1	0.1
September	1	0	0	1	1	3	1	0	7	0.9
October	1	1	0	4	2	3	0	2	13	1.6
November	1	4	4	3	0	2	6	2	22	2.8
December	3	3	3	4	1	1	2	2	19	2.4

## (ii) Manchester Weather Centre

Month	1961	1962	1963	1964	1965	1966	1967	1968	Monthly totals	Monthly averages
January	7	9	11	8	8	1	3	2	49	6.1
February	3	4	8	3	7	1	3	4	33	4.1
March	6	12	4	2	6	0	0	3	33	4.1
April	5	3	4	1	5	0	1	0	19	2.4
May	2	0	0	0	0	0	0	0	2	0.3
June	1	1	1	1	1	0	0	0	5	0.6
July	1	0	0	0	0	0	0	0	1	0.1
August	0	1	1	0	2	1	0	0	5	0.6
September	2	0	3	3	2	2	1	1	14	1.8
October	1	4	0	7	6	2	0	4	24	3.0
November	6	9	5	9	3	1	10	2	45	5.6
December	14	10	6	8	3	1	3	3	48	6.0

**TABLE 4: NUMBER OF DAYS PER MONTH WITH DENSE FOG AT ANY TIME OF THE DAY OR NIGHT (VISIBILITY < 500 m)**

(i) Manchester Airport

Month	1961	1962	1963	1964	1965	1966	1967	1968	Monthly totals	Monthly averages
January	3	4	6	3	3	0	3	0	22	2.8
February	0	0	1	0	0	0	2	4	7	0.9
March	0	1	1	0	0	1	0	3	6	0.8
April	1	1	0	1	0	0	1	0	4	0.5
May	1	0	0	1	0	1	0	1	4	0.5
June	0	1	0	0	0	0	0	1	2	0.3
July	0	1	1	0	0	0	1	0	3	0.4
August	0	0	0	0	0	2	1	0	3	0.4
September	1	0	2	2	0	3	1	1	10	1.3
October	1	4	0	2	2	4	0	2	15	1.9
November	0	3	4	3	0	2	5	2	19	2.4
December	6	2	0	4	0	0	3	2	17	2.1

(ii) Manchester Weather Centre

Month	1961	1962	1963	1964	1965	1966	1967	1968	Monthly totals	Monthly averages
January	4	4	3	3	5	0	2	1	22	2.8
February	0	0	1	0	1	0	3	2	7	0.9
March	1	0	1	0	0	1	0	1	4	0.5
April	1	0	0	0	2	0	0	0	3	0.4
May	1	0	0	0	0	0	0	0	1	0.1
June	0	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	1	1	0	2	0.3
August	0	0	0	0	2	1	1	0	4	0.5
September	1	0	1	1	1	1	0	0	5	0.6
October	1	3	0	2	4	2	0	1	13	1.6
November	1	2	2	4	2	1	6	1	19	2.4
December	4	5	1	4	1	1	3	0	19	2.4

**TABLE 5: COMPARISON OF WINTER FOG (<1000 m) FREQUENCIES AT MANCHESTER AIRPORT FOR 0900 GMT**

Month	Average No. Days 1955-60	Average No. Days 1961-68	Percentage Change (%)
January	3.7	2.9	-32
February	3.3	1.3	-60
March	0.8	0.6	-25
October	2.0	1.6	-20
November	4.3	2.8	-35
December	3.5	2.4	-31

Apart from these published sources of data, it is possible to extract time series information relating to visibility at the Airport from Meteorological Office reports. Table 7<sup>o</sup> clearly shows that a marked decrease in observations of fog of various densities has occurred between 1946 and 1970.

It is unfortunate that most of the information presented in Tables 2-7 relates to the Airport, and that only two sets of observations for the Weather Centre are available. Similarly, the Airport data cannot be conveniently summarised, as it is by no means uniform in relation to time periods, time of observations and visibility classes. Nevertheless, the tables may be employed to demonstrate that a significant improvement in visibility has occurred in Manchester.

Five year moving averages based upon Table 3 show that visibility (<1000m) has improved at the Weather Centre by about 40 per cent during the year as a whole, during the winter (October-March) and during November-January (the winter three months). Diagram 1 plots

the original data rather than the moving averages, but shows clearly the improvement in visibility. Similar averages based upon Table 4 show that visibility (<500m) has not improved to the same extent. The number of days with fog of this type at any time of the day or night decreased by 10 per cent over the year as a whole, by 15 per cent in winter and by 25 per cent during the winter three months.

Although an increase in the frequency of each category of fog occurred at the Airport between 1949-54 and 1955-59 (Table 2), this was more than outweighed by a decrease between 1955-59 and 1960-64. Visibility between 1949-54 and 1960-64 was 20 per cent better overall, and percentage decreases in fog frequencies increased with wind speed from 10 per cent at 0 knots to 40 per cent at 7-10 knots. Decreases for the various fog categories were 25 per cent (<220 yards), 10 per cent (220-440), 10 per cent (440-1100) and 25 per cent (1100-2200). The improvement in visibility <1000m is evident in Diagram 1.

The percentage change in winter fog frequencies (visibility <1000m) at the Airport between 1955-60 and 1961-68 is about 30 per cent (Table 5), the figure for November-January being slightly higher (35 per cent). During the 1960s, winter visibility (<1000m) has increased by about 10 per cent and winter three month visibility by 25 per cent, whereas visibility over the year as a whole has only improved by 5 per cent (Table 3). Table 4 may be used to demonstrate that visibility <500m fogs have decreased in frequency by very similar percentages (25.5, 0 per cent).

**TABLE 6: PERCENTAGES OF HOURLY OBSERVATION WITH VISIBILITY LESS THAN SPECIFIED VALUES DURING INDIVIDUAL MONTHS AND YEARS—MANCHESTER AIRPORT**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Visibility less than 40 m (44 yd)													
1959	2.1	0.7	0.1	0.1								0.4	0.3
1960	0.8	0.1							0.2	0.3		1.7	0.3
1961	2.9									0.4		3.7	0.6
1962	0.7									0.8		0.6	0.2
1963	1.0												0.1
1964									0.3		1.8	1.4	0.3
1965	1.0			1.0			0.1			0.3	0.1	0.1	0.2
1966	0.1								1.1				0.1
1967	0.3	0.3									1.5		0.2
1968		0.4	0.1								0.4		0.1
1959 to 1968	0.9	0.2	0+	0.1	0.0	0.0	0+	0.0	0.2	0.2	0.4	0.8	0.2
Visibility less than 200 m (220 yd)													
1959	11.2	7.9	2.3	0.3		0.1	0.3	0.1		0.1	0.4	0.8	1.9
1960	3.3		1.4	1.1		0.1			0.3	2.1	0.8	5.5	1.2
1961	5.0			1.2	0.8				0.1	1.7	0.7	8.8	1.5
1962	4.3			0.3			0.3			2.5	2.2	4.6	1.2
1963	9.4	0.1	0.3				0.7		1.2		4.1		1.3
1964	0.8	0.3		0.4		0.3			1.2	1.1	6.6	1.9	1.0
1965	5.8			1.5		0.3	0.1	0.4	0.1	2.3	0.8	1.7	1.1
1966	0.1		0.6		0.6			0.7	2.5	1.8	1.9		0.7
1967	2.9	2.2		0.4	0.4		0.4	0.3	0.4		7.7	1.5	1.3
1968	0.3	5.6	2.3	0.1	0.2				0.1	1.1	2.0		0.9
1959 to 1968	4.3	1.8	0.6	0.5	0.2	0.1	0.2	0.1	0.6	1.3	2.7	2.5	1.2
Visibility less than 1000 m (1100 yd)													
1959	20.1	15.0	4.3	1.1	0.4	1.1	0.6	0.7	0.1	1.5	6.0	3.7	4.5
1960	13.0	9.5		1.9	0.3	0.4	0.1	0.4	1.5	8.6	7.5	22.5	5.4
1961	8.6	2.2	1.7	2.6	1.2	0.1	0.7	0.3	1.9	2.6	6.5	16.2	3.7
1962	14.7	0.4	4.6	0.8	0.7	1.0	0.4	0.3		5.5	14.8	14.3	4.8
1963	23.9	4.3	1.4	2.8		0.3	1.2	0.1	2.8	0.1	7.7	4.3	4.0
1964	5.9	3.3	1.1	1.4	0.8	1.2	0.6	0.3	3.9	6.2	11.8	12.7	4.1
1965	12.1	4.2	0.3	2.4		1.4	0.8	1.0	2.2	4.7	3.6	4.3	3.0
1966	2.6		2.1	0.3	1.7	0.3	0.3	2.3	5.9	6.8	4.9	2.5	2.4
1967	8.2	5.2		1.4	1.4	0.4	0.7	1.8	2.5		18.2	7.4	3.9
1968	4.6	13.0	4.1	0.1	0.6	0.7	0.1		1.8	4.6	3.3	6.8	3.3
1959 to 1968	11.4	5.8	1.9	1.5	0.7	0.7	0.6	0.7	2.3	4.1	8.5	9.5	3.9

Percentage of less than 0.05 are noted as 0+

**TABLE 7: VISIBILITY AT RINGWAY AIRPORT 0900 GMT  
(NUMBER OF DAYS ON WHICH VISIBILITY FELL WITHIN CERTAIN CATEGORIES)**

	Year				Winter 6 Months				Winter 3 Months				Total < 1000 Winter 3 months
	0- 39	40- 190	200- 390	400- 1000	0- 39	40- 190	200- 390	400- 1000	0- 39	40- 190	200- 390	400- 1000	
1946	4	4	5	9									
1947	2	4	4	11									
1948	3	3	3	8	2	3	0	10	2	3	0	4	9
1949	0	3	0	9	1	1	2	4	0	1	1	2	4
1950	2	3	3	12	1	6	1	11	1	3	1	7	12
1951	0	5	1	5	0	3	1	8	0	1	1	3	5
1952	0	3	1	16	0	11	6	15	0	8	3	8	19
1953	0	11	7	11	1	4	3	12	1	1	1	7	10
1954	1	3	1	16	0	1	0	11	0	1	0	6	7
1955	0	2	2	11	0	3	2	15	0	2	2	8	12
1956	0	7	0	15	0	6	0	8	0	2	0	5	7
1957	1	1	2	6	1	3	3	3	1	2	3	1	7
1958	1	10	5	7	1	14	8	10	1	11	4	7	23
1959	1	7	5	8	0	4	1	7	0	2	1	5	8
1960	1	7	1	13	1	5	0	13	1	4	0	9	14
1961	1	6	1	8	1	6	1	5	1	5	1	4	11
1962	0	8	0	9	0	7	0	10	0	9	0	6	15
1963	0	4	0	12	0	3	0	9	0	2	0	6	8
1964	1	6	1	11	1	7	0	10	1	6	0	6	13
1965	1	4	1	6	0	0	1	3	0	0	1	0	1
1966	0	7	0	4	1	5	2	4	0	2	2	2	6
1967	2	4	3	7	1	8	2	5	1	5	1	3	10
1968	0	5	1	8	0	4	1	9	0	3	0	4	7
1969	0	6	2	8	0	5	3	4	0	4	1	2	7
1970					0	1	0	5	0	0	0	5	5

TABLE 8: SMOKE & SO<sub>2</sub> CONCENTRATIONS AT MANCHESTER AIRPORT \*1962-70

SO <sub>2</sub>	1962	1963	1964	1965	1966	1967	1968	1969	1970
January		409	194	204	206	179	165	140	134
February		236	167	244	105	101	191	216	115
March		115	136	165	103	63	132	144	108
April		96	88	101	98	104	90	104	
May		64	70	90	84	69	94	86	
June		64	78	99	70	64	71	68	
July		58	78	103	72	50	86	54	
August		51	73	91	75	50	66	58	
September		74	72	95	100	65	74	68	
October	116	67	178	128	152	50	87	79	
November	237	86	199	187	174	217	124	87	
December	273	212	310	181	122	169	169	166	
Year (average)		128	137	141	113	99	112	106	
Nov-Dec (average)	255	149	255	184	148	193	137	127	
Oct-Mar (average)	229	143	234	147	130	155	146	117	

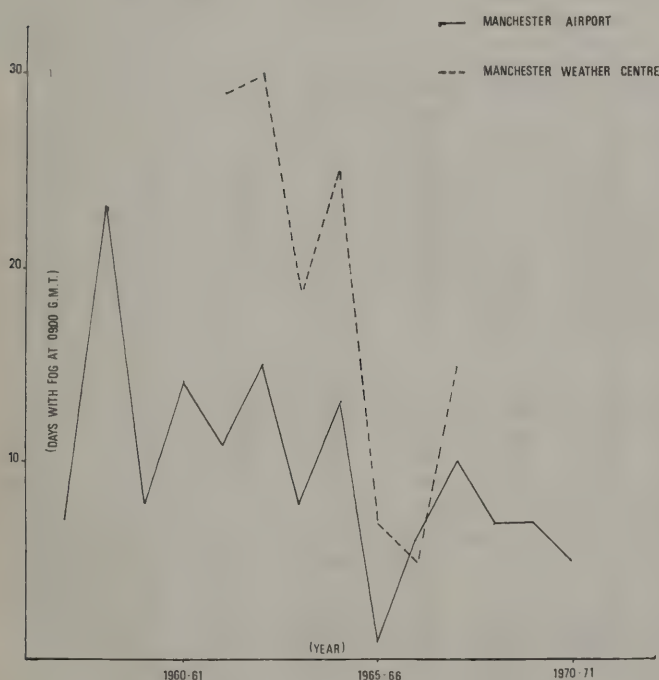
  

SMOKE									
January		295	157	130	123	147	89	88	79
February		181	142	160	42	63	109	119	73
March		85	80	76	55	26	57	77	58
April		74	43	52	48	47	44	50	
May		34	30	35	42	29	38	28	
June		34	36	32	23	23	22	29	
July		30	31	33	27	16	26	19	
August		26	37	35	30	23	23	27	
September		67	35	64	72	38	31	30	
October	116	52	139	87	135	27	48	48	
November	258	70	108	129	120	169	71	48	
December	243	263	242	137	76	117	114	120	
Year (average)		101	90	81	66	60	56	57	
Nov-Dec (average)	251	167	175	133	98	143	93	84	
Oct-Mar (average)	201	103	146	90	92	96	87	72	

\*Estimated

Diagram 1

Days with fog (visibility <1000m) at 09.00 GMT, during the months November-January at Manchester Airport (1957-70) and Weather Centre (1961-67)



Five year moving averages calculated from Table 7 show considerable variations in frequencies of various categories of fog at the Airport. In almost every case, however, there has been a percentage decrease in the frequency of fog observations between 1948-52 and 1965-69. These decreases are uniformly greater for

November-January than for the winter, and are greater for the winter than for the whole year. Over the year as a whole, visibility 1000m has improved by about 15 per cent during the period, with decreases for the year and winter three months being as follows:

40-65 per cent (<40m), +45-10 per cent (40-200), 10-15 per cent (200-400) and 35-55 per cent (400-1000). Similar averages based upon Table 6 reveal a uniform decrease in fog observations during the 1960s. Percentage decreases, which showed a pattern similar to that derived from Table 7 were 40 per cent (year) to 50 per cent (Nov.-Jan.) for visibility <40m, 25-40 per cent (40-200) and 25-45 per cent (200-1000). Diagram 2 plots the moving averages for visibility <400m and for 400-1000m from 1950, and clearly demonstrates the improvement which has taken place, especially in the former category.

Although concentrations of smoke and sulphur dioxide are summarised elsewhere,<sup>10</sup> Table 8 gives figures for the Airport (obtained by averaging readings in its vicinity) and Table 9 shows the equivalent figures for central Manchester, measured at a site close to the Weather Centre. In order to gain a historical perspective, Table 10 presents concentrations for two other Manchester sites, dating from 1950. SO<sub>2</sub> readings, which can probably be taken as an index of smoke concentrations, have been taken at Salford since 1932.<sup>11</sup> Concentrations then were similar to those in the early 1950s but a considerable fall may be observed between 1935 and the late 1940s. Table 10 shows that concentrations remained at a similar level throughout the 1950s until the early 1960s. This state of affairs probably applied at the Weather Centre and at the Airport also. Tables 8 and 9 show a reasonably steady decline in smoke and SO<sub>2</sub> concentrations during the 1960s especially at the Weather Centre. It is assumed that concentrations were not appreciably higher during the 1950s.

DIAGRAM 2

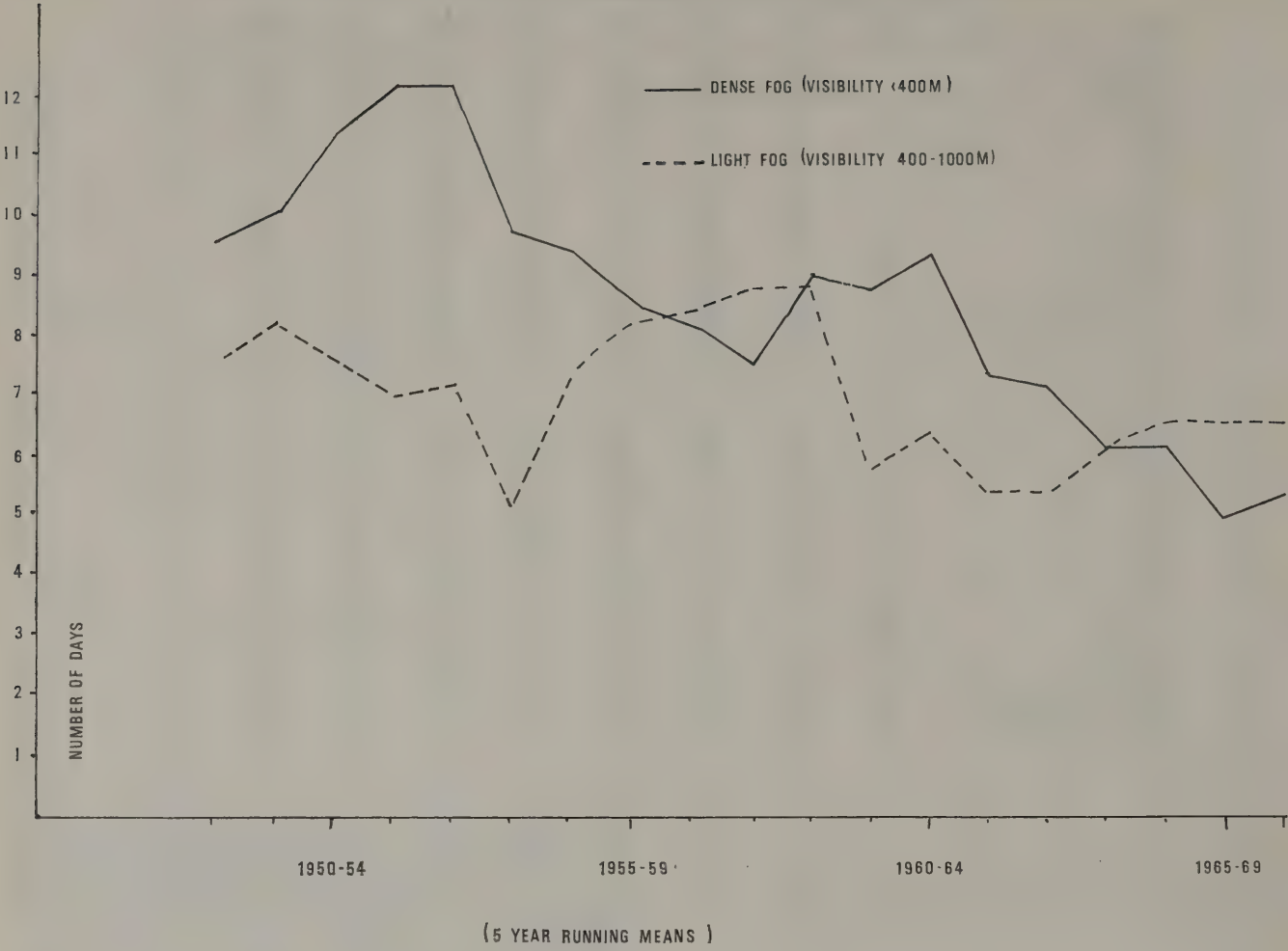


TABLE 9: SMOKE & SO<sub>2</sub> CONCENTRATIONS IN CENTRAL MANCHESTER 1959-70

SO <sub>2</sub>	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
January	1080	686	557	726	765	505	468	414	499	356	390	357
February	595	609	400	404	524	412	376	292	329	459	447	343
March	274	334	377	580	326	294	372	280	206	340	340	284
April	460	349	300	351	257	212	235	220	254	243		
May	191	237	163	277	161	140	179	160		240	187	
June	123	146	122	115	141	145	150	130	151	183	142	
July	97	163	159	138	145	146	162	112	137	177	105	
August	106	177	160	145	117	124	152	132	158		126	
September	220	226	193	191	232	193	223	231	213	171	144	
October	294	346	334	349	264	389	277	316	208	276	221	
November	511	474	484	590	333	472	385	369	603	323	245	
December	437	732	1027	726	505	527		347	405	379	383	
Year (average)	356	373	354	383	314	287	282	250	280	275	246	
Nov-Dec (average)	474	603	756	658	419	500	385	358	504	351	314	
Oct-March (average)	469	481	598	548	384	434	342	345	397	360	315	
SMOKE												
January	863	533	329	659	545	315	213	173	230	134	187	135
February	448	458	241	190	273	228	168	106	107	143	176	91
March	215	217	216	323	188	131	172	88	52	108	109	82
April	249	249	180	165	135	108	103	69	81	75		
May	157	170	108	134	91	76	79	52		84	58	
June	82	93	69	66	65	79	63	46	47	47	43	
July	101	128	55	75	90	63	68	36	44	49	32	
August	70	183	54	81	80	66	76	54	59		45	
September	193	233	96	115	193	93	125	126	84	70	53	
October	240	330	214	240	171	265	159	190	71	132	99	
November	410	361	326	472	209	278	188	123	245	156	84	
December	384	479	911	687	405	380	251	135	114	188	197	
Year (average)	284	286	220	267	204	174	139	100	103	104	97	
Nov-Dec (average)	397	420	619	580	307	329	220	129	179	172	141	
Oct-March (average)	376	326	443	401	241	249	151	138	135	159	115	

**TABLE 10: SMOKE AND SO<sub>2</sub> CONCENTRATIONS AT SALFORD 2 AND MANCHESTER 9/18 1950-70**

Year ending March 31st	SALFORD 2				MANCHESTER 9/18			
	SO <sub>2</sub>		SMOKE		SO <sub>2</sub>		SMOKE	
	Year	Winter	Year	Winter	Year	Winter	Year	Winter
1950	419	527	630	805	269	383	293	385
1951	447	595	499	678	255	376	255	318
1952	416	539	455	558	350	492	306	422
1953	458	646	598	822	280	390	237	331
1954	416	567	474	623	265	340	238	277
1955	409	542	441	582	310	439	236	332
1956	483	534	494	620	313	423	280	353
1957	397	544	471	607	269	350	246	313
1958	402	533	489	636	318	447	330	443
1959	475	695	515	722	287	402	333	492
1960	380	497	450	580	250	326	284	392
1961	420	588	508	730	264	361	299	424
1962	459	654	507	665	300	438	304	454
				558				
1963	472	624	570	794	310	467	301	456
1964	341	393	386	468	252	337	278	406
1965	362	469	367	512	271	398	253	391
1966	—	312	—	407	—	347	—	239
1967	—	—	—	—	—	305	—	209
1968	—	—	—	—	246	332	146	210
1969	—	—	—	—	—	—	—	—
1970	—	—	—	—	200	249	87	126

=====change of site from M/c 9 to M/c 18.

-----change of measuring apparatus.

That the significant recent improvement in visibility is at least partially due to a decline in pollution concentrations can be demonstrated. Tables 2 and 7 show that there was little, if any, decrease in the frequency of fog before about 1960. The larger number of fogs of the <1000m category occurring at the Weather Centre than at the Airport is probably due to higher pollution levels in the city. Denser fogs, which are less dependent upon pollution are more frequent at the Airport. The striking improvement in visibility in the city centre (particularly with regard to less dense fogs) is almost certainly due to the effects of smoke control.

At the Airport, where pollution levels are lower, smoke control is unlikely to have had so great an impact. The improvements in visibility recounted above have related to the densest categories of fog at least as much as to other categories. Nevertheless, pollution does appear to have been responsible for part of the fog pattern. If five year moving averages based upon Table 7

are employed, it can be shown that improvements in visibility were greater for thick and thinner fogs than for dense fogs between 1958-62 and 1965-69. Thus frequencies of fogs of <400m visibility declined by 38 per cent, whereas fogs of 400-1000m visibility declined by 46 per cent. This disparity is consistent with the use of pollution concentrations as an explanation of falling frequencies.

Regressions were run between smoke, SO<sub>2</sub> and the Table 3 and 4 fog frequencies. It was found that fog (<1000m visibility) frequencies at the Weather Centre during Nov.-Jan., the winter and the whole year were correlated with smoke concentrations at a significance level of 99 per cent. On the other hand, only the winter Airport values were significantly correlated (95 per cent). None of the <500m visibility correlations were significant at the 95 per cent level at either the Weather Centre or the Airport. These tests appear to confirm previous work on the relationship between pollution and visibility.<sup>4</sup> SO<sub>2</sub> correlation coefficients were similar to those for smoke.

### Sunshine

The number of hours of sunshine tends to be rather lower in Greater Manchester than in England and Wales as a whole. Table 11<sup>3, 12</sup> shows average annual figures for Manchester Airport, Manchester Weather Centre, Bolton and Rochdale. The semi-rural Airport has a considerably higher number of sunshine hours than the city centre Weather Centre, or the towns of Bolton and Rochdale, thus confirming the general pattern of urban climate.<sup>3</sup> Rochdale's low annual total may well be due to its high frequency of fogs. In general, annual and monthly average sunshine durations decrease from west to east across the conurbation,<sup>1</sup> though there are some north to south differences, as Table 12<sup>1</sup> shows. The number of daily sunshine hours at Bolton is consistently less than at the Airport, except during the summer months of May and June. In fact, the ratio between sunshine at these two sites varies seasonally, between 0.66 in December and 1.02 in June.

Table 13<sup>1</sup> gives the daily mean sunshine duration at the Airport as a percentage of possible sunshine. The seasonal pattern is not caused by month-to-month variations in cloudiness, since these are very small, but rather by an increased tendency to mistiness in winter.<sup>1</sup> (See Table 6). The general improvement in visibility would be expected to affect the sunshine statistics, and this is indeed the case. The 1961-70 average annual

**TABLE 11: AVERAGE ANNUAL SUNSHINE IN GREATER MANCHESTER 1951-67**

	E & W	M/c Airport	M/c Weather Centre	Bolton	Rochdale
Hours of Sunshine	1452	1335	1116	1260	1132

**TABLE 12: DAILY MEAN AND MONTHLY TOTAL, SUNSHINE HOURS, MANCHESTER AIRPORT AND BOLTON, 1931-60**

MONTH		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Daily Sunshine Hours	Bolton Airport	0.93	1.81	2.88	4.41	5.78	6.07	4.90	4.72	3.48	2.41	1.24	0.68	3.28
		1.09	1.96	3.21	4.59	5.70	5.97	4.97	4.88	3.87	2.76	1.44	1.02	3.45
Total Sunshine Hours	Bolton Airport	29	51	89	132	179	182	152	146	104	75	37	21	1197
		34	55	99	138	177	179	154	151	116	85	43	32	1263

**TABLE 13: DAILY MEAN SUNSHINE DURATION AS A PERCENTAGE OF POSSIBLE SUNSHINE, MANCHESTER AIRPORT 1931-60**

MONTH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Percentage	14	20	27	33	36	33	30	33	30	26	17	14	28

**TABLE 14: AVERAGE ANNUAL DURATION OF SUNSHINE, BOLTON AND MANCHESTER, 1901-1960**

Years	Bolton	Manchester (Whitworth Park)
1901-10	981	1009
1911-20	1029	991
1921-30	1026	1047
1931-40	1104	1022
1941-50	1205	1144
1951-60	1288	1072*

\*includes estimated results

**TABLE 15: AVERAGE MONTHLY SUNSHINE DURING THE YEARS 1958-67 AS A PERCENTAGE OF THE AVERAGE FOR 1931-60, LONDON**

STATION	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kingsway	155	116	117	87	105	103	101	102	115	126	140	173
Kew	120	94	105	83	101	99	98	96	107	113	114	718
Wisley	102	92	99	84	103	99	98	99	110	114	109	104

**TABLE 16: ANNUAL SUNSHINE TOTALS IN GREATER MANCHESTER COMPARED WITH ENGLAND AND WALES 1948-1970**

Year	M/c Airport	M/c W/c	Bolton	Rochdale	E & W	Airport $\times 100$ E & W	W/c $\times 100$ E & W	W/c $\times 100$ Airport
						%	%	%
1948	1348	1181.7	1180	—	1465	92.0	80.7	87.6
1949	1558	1439.4	1450	—	1695	91.9	84.9	92.4
1950	1268	1185.5	1245	—	1440	88.1	82.4	93.5
1951	1334	1094.3	1265	1188	1455	91.7	75.2	82.0
1952	1182	961.7	1270	1155	1499	78.9	64.2	81.4
1953	1354	1188.5	1335	1205	1490	90.9	79.8	87.8
1954	1129	850.2	1065	1040	1285	87.9	66.2	75.3
1955	1542	1249.1	1485	1400	1625	94.9	76.9	81.0
1956	1305	820.0	1262	1135	1420	91.9	57.7	62.8
1957	1320	990.8	1300	1165	1475	89.5	67.2	75.1
1958	1161	920*	1080	949	1290	90.0	71.3	79.2
1959	1657	1450*	1515	1385	1700*	97.5*	85.4*	87.5*
1960	1377	1200*	1315	1148	1402	98.2	85.5	87.1
1961	1387	1262.0	1320	1100	1505	92.2	83.9	91.0
1962	1319	1203.8	—	—	1520	86.8	79.2	91.3
1963	1365	1226	—	—	1415	96.5	86.7	89.8
1964	1305	1157	—	—	1400	93.2	82.7	88.7
1965	1304	1143	—	—	1340	97.3	85.3	87.7
1966	1244	1075	—	—	1322	94.1	81.3	86.4
1967	1411	1175	—	—	1500	94.1	78.4	83.3
1968	1293	1139	—	—	1275	101.4	89.3	88.1
1969	1383	1260	—	—	1382	100.1	91.2	91.1
1970	1454	1330	—	—	1484	98.0	89.7	91.5

\*Estimated values

value at Ringway is 1346 hours of sunshine,<sup>3</sup> which should be compared with the 1931-60 average of 1263 hours (Table 12). This increase is not, however, reflected throughout the North-West, where some stations show a decrease for the same periods.<sup>1</sup> At Bolton and Manchester there has been a long-term increase in the number of hours of sunshine throughout the century, as Table 14<sup>9,12</sup> proves.

### Sunshine and Pollution

The duration of sunshine in central London during the months November-January appears to have increased by about 50 per cent since 1958.<sup>2</sup> The average number of monthly sunshine hours at three sites in the London

area during the ten years 1958-67 has been compared with the corresponding thirty year averages for 1931-60. The results, expressed as percentages, for Kingsway (Central London), Kew (suburbs) and Wisley (rural environs) are presented in Table 15.<sup>13</sup> The difference in percentages between the three sites was small in summer, but the increase in sunshine hours was very marked at Kingsway in winter, less marked at Kew, and negligible at Wisley. Average annual sunshine is now about the same at the three sites, due to recent large increases in winter sunshine at Kingsway and, to a lesser extent, at Kew. The pattern of these increases is a striking proof of the relationship between air pollution and sunshine, since it reflects air pollution and smoke control statistics faithfully.<sup>2</sup>

### Sunshine and Pollution in Manchester

Sunshine data for each month of every year from 1880 have been obtained for Manchester.<sup>3</sup> Unfortunately there have been three changes of recording station, the last of which from Whitworth Park in 1957 to the Weather Centre in 1961, led to the estimation of certain readings in the time series. A set of monthly readings for the Airport from 1948 to 1970 has also been made available.<sup>3</sup> Information about sunshine at Rochdale and Bolton is, regrettably, less prolific.

Annual figures for the four stations, together with average values for England and Wales since 1948 are shown in Table 16.<sup>1,3,9</sup> Annual totals of sunshine hours at the Airport, the Weather Centre and Bolton have all increased during the period concerned, though there are obviously year-to-year variations. However, values for Rochdale and England and Wales show no discernible trend. In comparison with the England and Wales figures the Airport shows an increase to around 100 per cent (from about 90 per cent in 1948) and the Weather Centre shows an increase to around 90 per cent (from about 80 per cent in 1948, and 60-70 per cent in the late 1950s). The annual average at the Weather Centre is probably increasing as a percentage of that of the Airport.

Employing a procedure identical to that outlined above, it is possible to compare monthly average sunshine readings during 1961-70 with those during 1948-57 at the Weather Centre and the Airport. Table 17 shows the result of the comparison. Although the Airport's 1961-70 average annual sunshine total is only 1 per cent greater than the 1948-57 average, the winter average is 8 per cent greater and monthly figures for November, December and January are 22 per cent, 52 per cent and 26 per cent higher. Summer figures were lower during the second period, indicating that over the year as a whole the effects of reduced pollution on sunshine have compensated for decreases which have occurred for climatological reasons. (Sunshine hours in England and Wales were 5 per cent less during the second period than the first).

The Weather Centre received 9 per cent more sunshine during the year as a whole in the second period, and the winter average is 26 per cent higher. Average monthly figures during 1961-70 were 50, 68 and 52 per cent higher in November, December and January than during 1948-57. If 1961-70 is compared with the average values for 1931-57, the respective figures were 12 per

cent (year), 37 per cent (winter) and 40, 88 and 60 per cent (three winter months). The final rows of figures show that city centre sunshine increased in comparison with the airport during the period of comparison. (The annual figure was 0.82 in 1948-57, and is now 0.89, and the winter figure has increased from 0.70 to 0.82).

Because of the variability of sunshine from year to year, long-term average values must be taken, since figures for individual months and years appear to be inadequate for analysis purposes. Apart from comparing one period with another, moving averages centred about one year may be constructed. Diagram 3 shows 10 year moving averages for the winter three months for Airport

Diagram 3

10-Year Moving Averages for November-January hours of sunshine, Manchester Airport and Weather Centre 1945-70

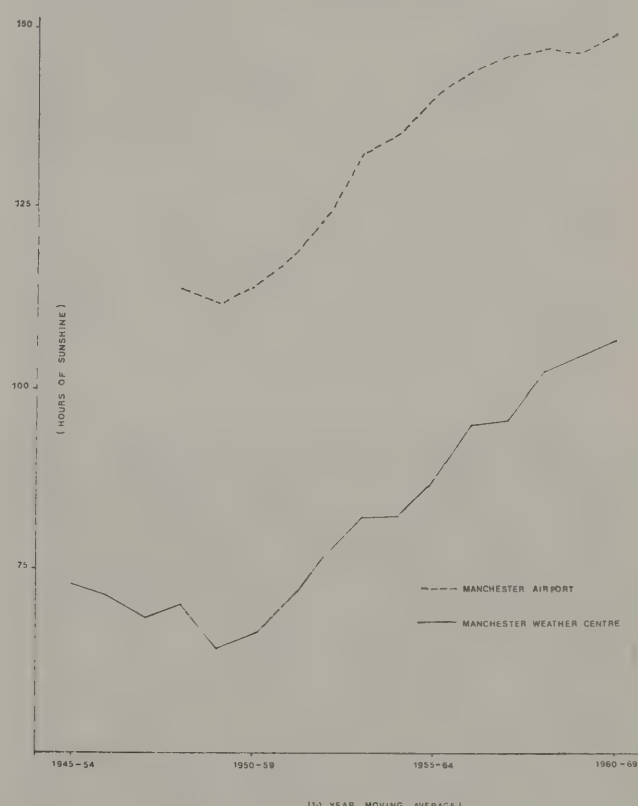
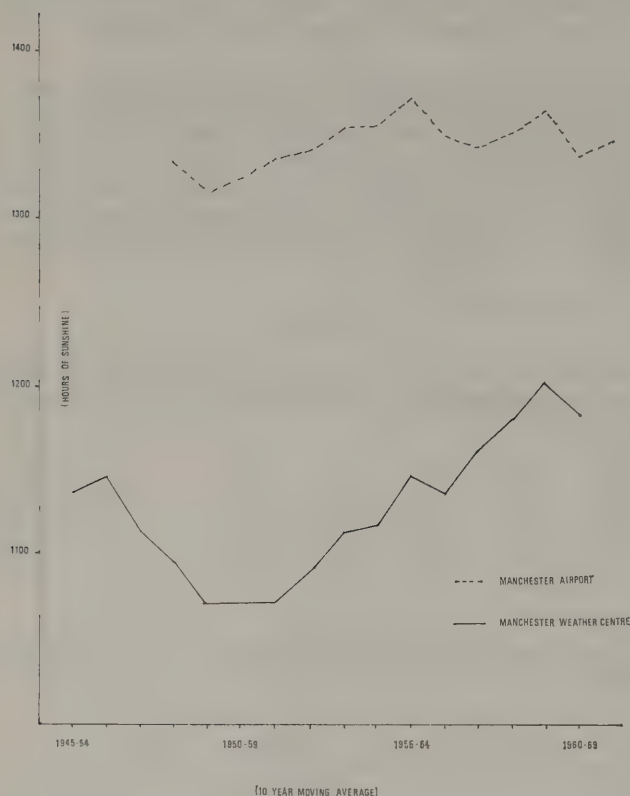


TABLE 17: AVERAGE MONTHLY SUNSHINE IN MANCHESTER DURING THE YEARS 1961-70, 1948-57, AND 1931-67

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Airport	1961-70	44	70	109	132	173	199	146	156	118	92	55	50	1347
	1948-57	35	63	122	155	195	185	161	138	114	90	45	33	1334
	61-70													
	% 48-57	126	111	89	85	89	108	91	113	104	102	122	152	101
Weather Centre	1961-70	32	55	96	122	158	186	135	143	105	86	42	32	1197
	1948-57	21	43	91	125	168	168	146	122	98	71	28	19	1096
	1931-57	20	38	82	119	160	161	138	139	100	65	30	17	1065
	61-70													
	% 48-57	152	128	105	98	94	111	93	117	107	121	150	168	109
	% 61-70													
WEATHER CENTRE	1948-57	60	68	75	81	86	91	91	89	86	79	62	58	82
	1961-70	73	79	88	92	91	93	92	92	89	93	76	64	89

Diagram 4

10-Year Moving Averages, hours of sunshine at Manchester Airport and Weather Centre, 1945-70 (annual)

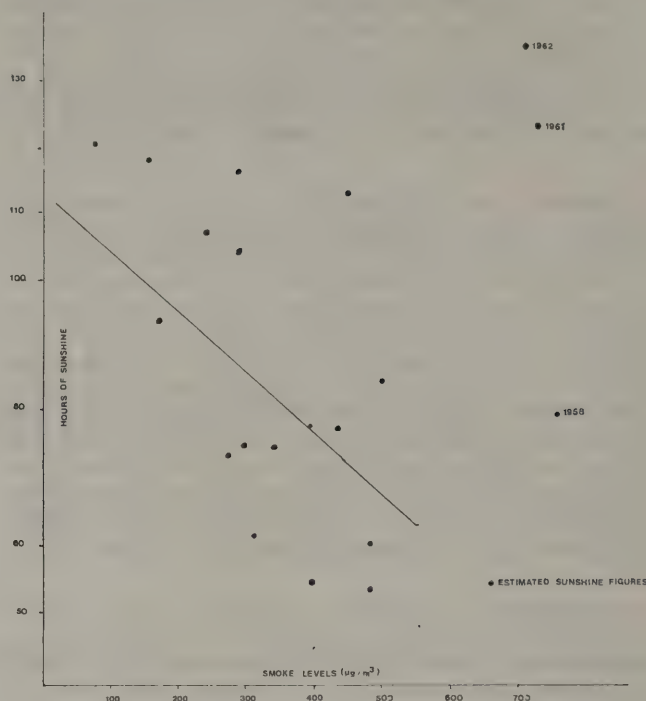


and Weather Centre readings and Diagram 4 presents the averages for the year as a whole. The three month averages show an unmistakable upward trend, and values are now 50 per cent higher than at the outset. The Weather Centre annual average falls at first, reflecting the low sunshine readings of the late 1950s. Over the last two decades, however, there has been a very considerable increase in total sunshine hours. This increase is much less marked at the Airport.

An attempt to obtain a correlation between the difference in sunshine hours at the Weather Centre and at the Airport with the difference in smoke or  $\text{SO}_2$  concentrations proved inconclusive. Air pollution is only one of many factors (e.g. inversions) affecting sunshine. Despite the difficulties of using data liable to random variation, an attempt was made to correlate the winter three month totals at the Weather Centre with smoke readings at Manchester 18 (close to the original Manchester station). The points are plotted in Diagram 5. A correlation significant at the 98.75 per cent level was obtained if the 1958, 61 and 62 values were ignored.

Diagram 5

Regression of Weather Centre, winter three months—sunshine with smoke readings at Manchester



(These three years, in fact, had very high smoke readings and were ignored on grounds of incomparability with the remaining readings). The evidence that the marked increase in sunshine is due to decreased pollution readings is thus extremely strong.

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## First Graduates - MSc in Environmental Pollution

Britain's first Masters in Environmental Pollution Control graduated from Leeds University in December 1972. Seven men and one woman now possess this rare qualification. The Leeds course was designed to equip

them with the basic knowledge to identify a wide range of pollution problems, assess their severity and recommend control measures where they are known, and to identify research needs where they are not.

The successful graduates were: Geoffrey Casey, Mrs. Jane Gower, Christopher Gray, Ian Kellie, Jayme Larica, Max Shwer, Robert Williams and Christopher Yates.

# BOOK REVIEWS

## 108th Annual Report on Alkali, &c. Works 1971

*Department of the Environment, Scottish Development Department, Welsh Office H.M.S.O. Price 75p net.*

This 108th Report is issued at a time when the Alkali Inspectorate is somewhat under fire. It is therefore interesting that the number of districts for which the Inspectorate are responsible have been increased from 12 to 15 and that eight more Inspectors have been appointed. Further, plans are going ahead for the formation of four testing teams each of two men, strategically placed around the country. The duties of these teams will be concerned mainly with testing for grit and dust emissions, but they will also undertake tests for metallurgical fumes and chemical gases as needed. As the report states, "only experience will tell how these teams and their testing duties will develop. In Scotland, when a grit and dust testing team was introduced a few years ago, it was found that works concerned elected to carry out their own check tests and showed a much greater interest in emission control."

The number of works registered under the Act at the end of 1971 was 1,875 involving the operation of 3,003 processes. During the year 9,782 visits and inspections were made and 357 specific complaints were dealt with. It is interesting that the greatest number of complaints were against mineral works and mineral works were scheduled under the Act as from 1 July 1971.

Mr. Ireland reports that during the period under review there were 38 infractions, half of which occurred in metal recovery works.

In the 107th Report Mr. Ireland mentioned that the Inspectorate "were preaching to industry the appointment of Environmental Control Officers to look at works effluent problems broadly, to ensure that regulations were being met and to act as a communications link with the public. Mr. Ireland is now able to report that this has had a good response but stresses that there is still a need for good public relations. The report continues "attitudes on confidentiality have changed . . . and prodded by the Inspectorate, industry is learning to become a responsible member of the community and to speak to its neighbours in a more open way than ever before. . . . Standards of emission, requirements, methods of enforcement, policy-making and decision-taking have all been described and far more is now known by the public about the Inspectorate's work than ever before. The subject has been discussed deeply at national and international conferences and we welcome the publicity. . . . But the managements themselves must become involved and it is the local people who must be told."

"Many of the issues cause great controversy even amongst the experts and lead to opposing opinions about the effects of pollution. The relationship between emissions and their effect on the environment is complicated and only a relatively few people are capable of

properly assessing emission data. . . . As an example of complications, Professor Scorer has attempted to compare the relative damage caused by burning coal in different situations. He has estimated that the burning of one ton of coal in domestic grates is about as damaging to the environment as 200 tons of coal burnt in a power station. . . . My experience is that looking at emission figures does not tell the whole or even the true story of pollution of the environment. Simple judgments will be attempted for a complicated subject. Nevertheless, information should be given, but the release of total information in an incomprehensible manner without relating it to effects is as much to be deplored as giving none."

Mr. Ireland goes on to say, "Unfortunately, there are extremists in the environmental movement who believe in the use of scare tactics based on unbalanced information in order to sway public opinion. I believe such tactics can be counter productive and that the public should be put in a position to make a proper value judgment."

The report deals at length and in detail with control of unregistered works and with registered works in their various categories. There is a full statement about the commissioning of the Holyhead aluminium works and the difficulties which were encountered and which have been overcome. "The iron and steel industry," says Mr. Ireland, "represents one of the Inspectorate's most difficult problems. The scale of operations is enormous and process conditions are exacting on men and materials of construction. Temperatures range up to 2,000°C. There is a real need for more positive thinking on pollution control than in the past and with the appointment of co-ordinators by the British Steel Corporation for each of its divisions, we are optimistic that broader looks will be taken at environmental problems and that production will no longer be associated with dirty conditions."

As may be expected the report has much to say about lead works. "The Inspectorate has always had a healthy respect for the toxic properties of lead and its compounds. . . . Finding practicable solutions is not easy. . . . The precise limits of the Inspectorate's responsibilities at registered works are not clearly defined and this is perhaps a good thing, as it permits us to take a broad view and have remedies applied wherever we find the escape of a noxious or offensive material into the environment. . . . It is also appreciated that materials can find their way into the environment by many routes other than from chimneys, what are often loosely described as "low level emissions". For inert materials, these escapes may be of little consequence, but when highly toxic materials like lead are concerned, action to contain them within works premises is essential."

During the year under review there were 36 complaints about electricity generating stations. "Many stations have experienced troubles with equipment, leading to justified complaints. The Generating Boards have made worthwhile efforts to gain more acceptable conditions, but there is still much room for improvement. Such is public feeling and sensitivity that at times complaints about emissions have been made when stations have been shut down! This was not the case when combustion conditions were lost at one station during start-up and pulverised fuel was emitted over the surrounding area."

Mr. Ireland admits that "coke ovens continue to be uneasy neighbours and we try to persuade planners not to develop residential or other sensitive property too close to the works. Pre-fabricated houses adjacent to a coking plant have been demolished and replaced by houses for elderly people and a clinic!"

So far as the cement industry is concerned the report states that the story is "one of continual general improvement with modernisation, increased electrical precipitator capacity and replacement of old by new precipitators. . . . We have estimated from emission tests that 10 years ago the national emission of dust from cement works chimneys was of the order of 100,000/200,000 tons per year. Present day emissions are calculated to be about 30,000/40,000 tons per year, perhaps less. There have been corresponding improvements in escapes from lower level sources. This does not mean that we are satisfied with the present emissions and we continually strive for further improvements. There are also some well known black spots to be eliminated."

Planning again comes in for criticism in connection with mineral works. Mr. Ireland says: "Many bad planning decisions have been taken in the past and have been perpetrated during the past year. Let us hope that we can influence planners to keep mineral works and houses apart."

Dr. Birse in his report on behalf of Her Majesty's Industrial Pollution Inspectorate for Scotland gives some interesting information regarding refusals to renew registration. He says: "After the enactment of the Clean Air Act of 1956 a large number of works in heavy industry were scheduled by the Alkali Order of 1958 and so brought within the provisions of the Alkali Acts for the first time. The discretionary power to issue certificates of registration without the provision of best practicable means was exercised in a substantial number of cases. The owners of the great majority of these works provided, and in some cases devised, the necessary means of air pollution control. A handful of owners, however, did not do so for reasons which could no longer be upheld. In 1970 these owners were advised that unless action was taken to control emissions renewal of registration would have to be withheld. Action was not taken by three owners receiving this advice and registration was not renewed. As a result two ceramic works were shut down." In the third case, following an appeal, the works operating a Tropenas furnace was also closed.

Dr. Birse states that the rise in the volume of complaints showed no sign of decreasing in the year under review. "Most of the complaints were found on investigation to be justified but they were often caused by some malfunctioning of process plants. The public are becoming less tolerant of these aberrations and unless firms make known locally their difficulties and their efforts to overcome them they risk a hardening attitude towards

themselves. Communication in this way is no substitute for controlling pollution and it will not necessarily ensure acceptance by the public, as one firm found during the year when an interdict action was raised against it as a result of giving forewarning of the likelihood of abnormal noise during commissioning of a boiler plant." Dr. Birse concludes his general comments by saying: "Because of the progress already made in the control of air pollution, the law of diminishing returns is likely to operate against further very marked improvement, but this leaves no ground for complacency. One of the basic difficulties of pollution control, however, is that there are few firm scientific or economic guidelines for assessing the degree of control which should be attained. As a biologist concerned about environmental pollution said . . . ignorance has led on occasion to over-reaction about pollution. The Inspectorate have to avoid an emotional approach to pollution control and seek a fair and reasoned interpretation of the basic requirement of the Act. . . . Economic considerations have to be taken into the interpretation of this requirement, and ideally a cost benefit analysis should provide the basis of decision. On the benefit side, however, there are social aspects of pollution which defy economic analysis."

As ever this whole report is extremely informative and is eminently readable. We consider that it should be read, marked, learned and inwardly digested by every reader of this journal.

Reader Enquiry Service No. 736

#### **Coal's Prospects in the Enlarged European Community** *Combustion Engineering Association Conference, 1972.*

Britain's entry into the Common Market will enlarge the potential for coal and it was against this background that the Conference examined the prospects for coal in the enlarged European Community. The papers presented sought to forecast the World demand for energy, and then the European scene from both the United Kingdom and Continental viewpoints in regard to the contribution which coal could make. The Conference also dealt with the economics of solid fuel and three papers described recent industrial installations in this country specifically designed to burn coal and gave the reasons for choosing coal as a fuel.

The first paper was given by Mr. M. J. Parker and was entitled "European Energy in a Worldwide Context". In his introduction the author stated that the purpose of his paper was to review again levels in European energy over the past 10 years or so, and to point to the significance of these levels for the future. In doing so, he gave consideration to the worldwide position, without which the European position could not be understood. He also showed that, on any reasonable view of the future probability, there was an overwhelming need for West European Energy policy based on the primacy of indigenous sources, with coal continuing to play a substantial part in total energy supplies.

"The United Kingdom Viewpoint" by C. W. Howard and "The Continental Viewpoint" by K. H. Hawner, reviewed the main developments in the European Coal and Steel Community and the present situation in the West European coal market. The case for a new approach to a European energy policy, based on maximising the use of Europe's indigenous energy resources, was given, emphasising the important contribution which would need to be made by the European coal industry in this context.

In "The Economics of Solid Fuel" M. J. Edwards said that the key to the industrialist's fuel problem was how to get the best deal now, and for five to 10 years ahead, on supply and price in a worldwide commodity market with all the fluctuations to which this must be subject. Based on the practical experience of firms who had burnt coal on modern plant during the past 10 to 20 years, coal had offered a fair deal despite all the market fluctuations in that period. With increasing problems on security during the next 10 to 20 years, there was every reason to believe that industrialists who burnt coal would continue to do so at least as well in the future as in the past.

Mr. L. A. Robey's paper "New Bowater Power Plant, Ellesmere Port" was an account of the fuel policy adopted by Bowaters in their larger U.K. Mills and a description of the new industrial power station at Ellesmere Port.

"A Recent Installation of Shell Boiler Plant in the Textile Industry" by D. Gisbourne and D. Long, gave some of the more important factors that affected the choice and layout of Shell Boiler Plant at a Textile Works in Bradford.

The final paper "New Shell Boiler Plant in the Food Industry" by R. M. Davis, discussed the choice of boiler to be installed as stand by capacity, producing low pressure steam for processing, in an existing coal fired water tube boiler house producing high pressure steam for electrical generation.

Reader Enquiry Service No. 737

#### **Annual Report of the Scientific Adviser**

*Greater London Council, 1971. £2.00 (postage extra).*

This report is a clearly written and excellently presented summary of the work of the Scientific Branch of the Greater London Council for 1971. It is divided into six main parts: water pollution control and refuse disposal; building materials for construction and maintenance; environmental studies; statutory; general supplies and services and general.

In the section on air pollution the Report states that the average concentration of 'smoke' (black suspended matter) in the air of Inner London, as monitored at the seven representative sites in Inner London, is now only a quarter of the estimated level for 1955-6, before the introduction of the Clean Air Act. The level in 1971 was 48 microgrammes per cubic metre, similar to the figure recorded in 1970. The fears that a temporary shortage of authorised solid smokeless fuel would lead to a return to the days of the London smogs proved to be unfounded and it is now nine years since London experienced a major smog. In fact, in spite of the suspension of a large number of smoke control orders for the winter of 1970-71, the annual average concentrations of smoke for 1970 and 1971 were about 8 per cent lower than for 1969. The highest local 24-hour average concentration of smoke recorded in 1971 was only 375 microgrammes per cubic metre compared to a value of 2,890 recorded during the last smog in 1962.

The reduction of smoke concentration and absence of dense fogs has given the added bonus of increases in sun penetration and in visibility, especially in the winter months when early morning mists were soon dispersed by the sun.

The average concentration of sulphur dioxide as measured at seven representative sites in Inner London has fallen steadily since 1964. In 1971 the annual average concentration was 137 microgrammes per cubic metre representing a reduction of 5 per cent since 1970 and amounting to only 59 per cent of the level for 1955-6. The highest 24 hour local average concentration recorded at any one of these sites was 929 microgrammes per cubic metre, which is less than a quarter of the corresponding maximum during the 1962 smog.

The decrease in sulphur dioxide pollution may be attributed to several causes. The total emission of sulphur dioxide in London is falling and much is now emitted from taller chimneys and is widely dispersed, thus making a smaller contribution to ground level concentrations. The use of natural gas, which is almost free of sulphur, as an alternative fuel will also play an increasing part in further reducing ground level pollution.

The City of London (Various Powers) Act 1971, has been promoted and passed in an effort to reduce sulphur dioxide pollution within the one square mile area of the City. This Act limits the sulphur content of fuel oil burnt in new furnaces to 1 per cent, as in some other cities of the world. The Report states that it is not envisaged that it would be practicable for such legislation to be extended throughout the country but it may well prove to be a way to reduce sulphur dioxide levels in the centres of large cities.

The Report goes on to say that the dramatic reduction in pollution by smoke from domestic fires and industry has by contrast made the pollution emitted by vehicles on busy roads more apparent. The dispersion of exhaust fumes in streets is highly dependent on weather conditions and pollution is at a maximum on calm days. The Branch has continued to make measurements of pollution, either by spot tests with portable sampling equipment during calm weather to measure the maximum pollution likely, or by continuous monitoring over a period which is hoped included a variety of weather conditions. It was confirmed that, in general, the levels of pollution in London streets fall within what are currently considered to be medically acceptable limits.

It is thought that photochemical smog is unlikely to occur in London because of its latitude, degree of pollution and prevailing wind. However, because of its occurrence in recent years in an area of the Netherlands between The Hague and Rotterdam, at a similar latitude to London, and the increased sunshine and car usage in London, early warning safeguards are being put into effect to ensure no unsuspected buildups of the conditions leading to this type of smog arise. Preliminary monitoring of these factors has started at County Hall.

The Warren Spring Laboratory carried out a survey of air pollution in and around Heathrow Airport in the period April-September 1970 and the published results show that the levels measured in the airport do not exceed levels commonly found in Inner London. However, it is clear that the odour of paraffin from the aircraft extends over a wide area and the Scientific Branch had discussions with the local borough about the possibility of monitoring this.

The Environmental Studies section of the Report also includes reports of fumes and contaminants causing complaints or hazards; ventilation; environmental radiation and noise.

Reader Enquiry Service No. 738

Now we're in a Smoke Control Area how will it affect me?

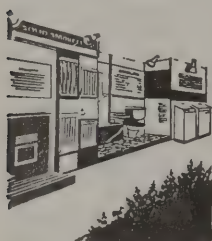
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Now that people are becoming more aware of the need to improve the quality of life they're asking some pretty pertinent questions. Giving the answers is a responsibility that's not always easy to meet. So the S.S.F.F. have devised four encompassing ways of presenting information simply and clearly. Exhibitions, Mobile Units, Displays and Literature are all available free to local authorities from the S.S.F.F. They're designed to tell householders how the Clean Air regulations affect them; to show the kind of benefits House Improvement grants can give; and how the latest solid fuel appliances meet heating needs cheaply, efficiently and smokelessly. Take advantage of the Federation's experience—it'll help people to make the most of older houses—and that's one way of easing the pressures of the housing situation.



### Advisory service

The Federation can provide free advice on home heating by Solid Smokeless fuels. Specialists highly experienced in all aspects of heating in modern housing developments can be made available at an early planning stage.

### Exhibitions

Complete prefabricated, self-contained Exhibitions for Clean Air and House Improvement Schemes.

### Mobile Units

Staffed by trained operators to advise and help residents in new or proposed Smoke Control Areas and House Improvement Schemes.



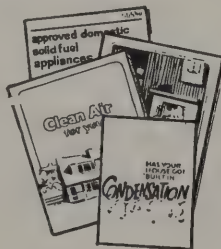
### Displays

A range of portable units giving information on all aspects of Clean Air Act, House Improvements, fuels and appliances.



### Literature

The Federation's Publications are fully illustrated. They explain the requirements of the Clean Air Act and provide general information on better home heating and condensation problems.



For more information on the advice and assistance that the S.S.F.F. can give to local authorities, please get in touch with

**SOLID SMOKELESS FUELS FEDERATION,**  
YORK HOUSE, EMPIRE WAY, WEMBLEY, MIDDX,  
HA9 0PA. Telephone: 01-902 5405

Reader Enquiry Service No. 7312

## Indoor-Outdoor Air Pollution Relationships: a Literature Review

U.S. Environmental Protection Agency, 1972.

Extensive measurements have been and are being made of outdoor pollution. In contrast, very few data have been gathered on indoor pollution, especially in view of the importance of the problem. The data that are available are compiled and analysed in this report. Based on a review of the literature, it was possible to infer relationships between indoor and outdoor pollution and to identify factors that affect these relationships. The relationships identified must be considered tentative, however, and further research is recommended to determine their validity.

Except for bacteria, and, perhaps, for fungus spores, indoor pollution levels appear to be controlled primarily by outdoor concentrations. Other factors that influence indoor pollution levels include internal activities and pollution generation, atmospheric conditions and natural ventilation, time, location, type of building and air-conditioning and filtration systems. At present, the best available estimate of indoor concentrations of particulates and non-reactive gases can be obtained by assuming them equal to outdoor concentrations. Indoor concentrations of pollen and reactive gases, expressed as a percentage of outdoor concentrations, decrease with increasing outdoor concentrations. Bacterial concentrations indoors appear to be more closely related to the presence and activities of people inside than to outdoor concentrations.

Reader Enquiry Service No. 739

## The Biology of Pollution

Kenneth Mellanby. *Institute of Biology: Studies in Biology No. 38.* Edward Arnold, 1972. £1.50 (hardback) £0.75 (paperback).

In this book the author stresses the effects of pollution on living organisms, believing this to be the best way in which to appreciate the real influence on the environment of pollution in all its various forms, and that only upon this knowledge can a rational programme for pollution be built.

The book is divided into seven sections, entitled: what is pollution?; air pollution; water pollution; thermal pollution; radiation; pollution of the sea and pesticides. A useful appendix outlines a variety of practical experiments on pollution that can be performed by students individually or under supervision, and a list of further reading. A clearly written and presented book, probably intended primarily for teachers and students but with strong appeal for the general reader.

Reader Enquiry Service No. 7310

## Cascade Impactor Network

Robert E. Lee and Stephen Goranson. U.S. Environmental Protection Agency, 1972.

Characterisation of suspended particulate pollutants in ambient air is usually limited to estimating the quantity of total suspended particulate (microgrammes of particulate per cubic metre of air) and determining the gross concentrations of a number of chemical components. The National Air Surveillance Networks of the U.S. Environmental Protection Agency operate a nation-wide system of high volume air samplers; particulates are collected on glass-fibre filters for a 24-hour period and analyzed by gravimetric and chemical methods. Although these measurements can give some indication of the general pollution level in an area, they do not provide information concerning the size distribution of total suspended particulate matter.

Because the degree of respiratory penetration and retention is a direct function of aerodynamic particle size, knowledge of the particulate size distribution of suspended particulates is essential in assessing the inhalation health hazard. The particle size, composition, and concentration of aerosol constituents determines the extent of visibility reduction, particle-particle and particle-gas interactions, soiling, deterioration of materials, and a wide range of atmospheric phenomena. Furthermore, the particle size of suspended particulates is important in meteorology (particularly as it affects formation of precipitation) and in geophysics (particulates can scatter solar radiation back into space). Until now, data on particle size distribution of suspended particulates have been difficult to obtain because available fractionating devices either require excessively long sampling periods to collect sufficient material for gravimetric or chemical analysis, or provided inadequate resolution of sizes. Recently, however, Lee and Flesch described a high-volume particle fractionating cascade impactor that overcame most of these disadvantages. This fractionator was adapted from an Andersen cascade impactor, a commercially available device that has been used for some limited air pollution studies.

In an effort to characterize the particle size distribution of suspended particulate matter on a routine basis, an experimental network of the modified cascade impactors was established in six urban areas in January 1970. A 24-hour sample was collected once every two weeks according to a schedule established earlier for an EPA study of pollutant effects. This Report describes the results that were obtained from the first year's operation of the network, some problems that were encountered in the operation, and plans that were made for expanding the network.

Reader Enquiry Service No. 7311

### New additions to the National Society for Clean Air Library, available on loan

**Clean Air Council.** Domestic Smoke Control in the North East. Report by a panel of the Council. 1972.

**Alkali Inspectorate.** 108th Annual Report on Alkali etc. Works 1971. H.M.S.O.

**The Combustion Engineering Association.** Conference 1972. Coal's Prospects in the Enlarged European Community. (7 papers).

**U.S. Environmental Protection Agency.** Indoor-Outdoor Air Pollution Relationships: a literature review. 1972.

**Mellanby, Kenneth.** The Biology of Pollution. Institute of Biology's Studies in Biology No. 38. Edward Arnold, 1972.

**Greater London Council:** Scientific Branch: Director General's Dept. Annual Report of the Scientific Adviser. 1971.

**U.S. Environmental Protection Agency.** Cascade Impactor Network by Robert E. Lee and Stephen Goranson. 1972.

**U.S. Environmental Protection Agency.** Odours and air pollution: a bibliography with abstracts. 1972.

**Programmes Analysis Unit.** An Economic and technical appraisal of air pollution in the United Kingdom. H.M.S.O. 1972.

**The Plastics Institute.** Some aspects of plastics waste disposal. Interim Report of the Working Party on Designing for Disposability.

**Pigott, Francis.** Free Fall to ? Essays of Dissent No. 2. Richard Kay, 1972.

**Cuzner, G. D.** Pollution: a select bibliography. Manchester Public Libraries. 1972.

**Sugden, F. G.** Air pollution control in reorganised Local Government. Public Works Congress. 1972.

**Loftas, Tony.** The Last Resource: Man's Exploitation of the Oceans. Pelican. 1973.

**Clarkson, B. L.** The Social Consequences of Noise. Lecture to the Institution of Mechanical Engineers. Feb. 1972.

**Sadler, P.** Social Implications of Automation. Lecture to the Institution of Mechanical Engineers, March, 1972.

**U.S. Environmental Protection Agency.** Mercury and Air Pollution: a Bibliography with Abstracts. October, 1972.

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## OBITUARY - DR. JOHN LANCELOT BURN

It was with great regret that we received notice of the death of Dr. J. L. Burn, M.D., D.Hyg., D.P.H., Medical Officer of Health for the City of Salford. Dr. Burn died suddenly on Monday, 1st January, 1973; he was aged 70 and leaves a widow and six children. Dr. Burn, who was born in North Shields, was educated at Durham University where he qualified in medicine and surgery in 1931; two years later he obtained his M.D.

He came to Salford in 1941, after serving at Barnsley and Plymouth. During his service as Medical Officer of the City of Salford, the City was first in many fields of preventive medicine. Under his guidance Salford became the first city in Britain to wipe out diphtheria, the great child killer, the first to register a nil figure for maternal mortality, and the first to tackle tuberculosis by mass x-ray of all its citizens.

Dr. Burn also laid the ground work for the clean air programme which enabled Salford to be the first industrial city in Europe to cover the whole of its area with Smoke Control Orders. He was a very active member of the National Society for Clean Air serving for many years on the National Executive Council and the Divisional Council of the North West. His interest in clean air was marked by his inclusion on the Beaver Committee which gave us the Clean Air Act of 1956. He was a man dedicated to his chosen profession with a great love of his fellow man which made him bequeath his body to Manchester University Medical School for research purposes. It is with regret that we have to record the passing of so fine a gentleman and colleague.

A memorial service was held at the Salford Cathedral on 20th January at 12 noon.

# SMOKE CONTROL AREAS

## Progress Report

Position at 31st December 1972

(Figures supplied by the Department of the Environment)

	<i>England</i>			<i>Wales</i>			<i>Scotland</i>			<i>Northern Ireland</i>		
<b>Smoke Control Orders Confirmed prior to 30.9.72</b>	3,829	1,133,030	5,387,341	8	1,097	4,979	219	115,883	523,991	49	11,587	25,910
<i>Acres</i> .. .. .												
<i>Premises</i> .. .. .												
<b>Smoke Control Orders Confirmed (30.9.72-31.12.72)</b>	66	22,652	92,787	—	—	—	6	—	—	2	680	2,459
<i>Acres</i> .. .. .												
<i>Premises</i> .. .. .												
<b>Totals</b> .. .. .	<b>3,895</b>	<b>1,155,682</b>	<b>5,480,128</b>	<b>8</b>	<b>1,097</b>	<b>4,979</b>	<b>225</b>	<b>—</b>	<b>—</b>	<b>51</b>	<b>12,267</b>	<b>28,369</b>
<b>Smoke Control Orders Submitted</b> .. .. .	143	61,271	207,164	—	—	—	4	—	—	3	814	1,897
<i>Acres</i> .. .. .												
<i>Premises</i> .. .. .												
<b>Grand Totals</b> .. .. .	<b>4,038</b>	<b>1,216,953</b>	<b>5,687,292</b>	<b>8</b>	<b>1,097</b>	<b>4,979</b>	<b>229</b>	<b>—</b>	<b>—</b>	<b>54</b>	<b>13,081</b>	<b>30,266</b>
<b>Smokeless Zones (Local Acts) in operation</b> .. .. .	44	3,400	41,060	—	—	—	—	—	—	—	—	—
<i>Acres</i> .. .. .												
<i>Premises</i> .. .. .												

## SMOKE CONTROL POSITION IN REGIONS OF ENGLAND

at 31st December 1972

(Figures supplied by the Department of the Environment)

(1) <i>Region</i>	(2) <i>No. of black area acres covered by smoke control and smokeless zones orders confirmed or awaiting decision</i>	(3) <i>Percentage* of total black area acreage in region covered</i>	(4) <i>No. of black area premises covered by smoke control and smokeless zones orders confirmed or awaiting decision</i>	(5) <i>Percentage* of total black area premises in the region</i>
Northern .. .. .	55,966	44.7	232,077	42.0
Yorks & Humberside .. .. .	236,343	62.8	781,510	67.0
East Midlands .. .. .	81,723	30.5	252,502	49.3
Greater London .. .. .	277,861	95.0	2,362,769	89.3
North West .. .. .	230,855	57.5	975,444	57.3
West Midlands .. .. .	99,193	39.8	447,651	42.6
South West .. .. .	11,231	42.6	41,278	27.7
Total (black areas) .. .. .	993,172	56.0	5,093,231	65.5
Outside black areas .. .. .	223,781		594,061	
<b>Grand Totals</b> .. .. .	<b>1,216,953</b>		<b>5,687,292</b>	

\* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (eg: there may be some areas of open country).

# New Smoke Control Orders

The lists below are supplementary to the information in the last issue of **Clean Air (Winter 1972)** which gave the position up to **30 September 1972**. They now show changes and additions up to **31 December 1972**.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

## ENGLAND NEW SMOKE CONTROL ORDERS IN OPERATION

### Northern

Gosforth U.D. (No. 2), Boldon U.D. (No. 19), Teesside C.B. (No. 9 and 'B' Elm Tree Farm, Stockton), Blaydon U.D. (No. 4), Darlington C.B. (Nos. 7 and 8), Hebburn U.D. (No. 13), South Shields C.B. (Nos. 7 and 8), Jarrow B. (No. 6), Hartlepool C.B. (No. 21), Newcastle upon Tyne C.B. (No. 14).

### Yorkshire and Humberside

Leeds C.B. (Nos. 94, 95, 98, 99, 100, 101, 102 and 103), Mirfield U.D. (No. 12), Rawmarsh U.D. (No. 1), Keighley B. (No. 8), Swinton U.D. (No. 14), Doncaster C.B. (No. 13), Sheffield C.B. (No. 22).

### North West

Horwich U.D. (Nos. 3 and 5), Bolton B.C. (East and West Wards; Rumworth No. 2 and Bradford and Derby Wards), Oldham C.B. (Nos. 17, 18, 22 and 23), Preston C.B. (No. 25), Radcliffe B.C. (No. 7), Royton U.D. (Nos. 8 and 9), Wigan C.B. (No. 8), Dukinfield B.C. (No. 16), Ashton-under-Lyme B.C. (No. 12), Ellesmere Port B.C. (Nos. 11 and 12), Stretford B. (No. 15), Darwen B.C. (No. 9), Dudley C.B. (No. 59), Failsworth U.D. (No. 10), Kearsley U.D. (No. 5), Worsley U.D. (Linnyshaw Pt. 2), Manchester C.B. (Butler Street; Oxford Road; Irk Valley; Leicester Road; Stockport Road; New Cross and Livesey Street), Padiham U.D. (No. 12), Leicester C.B. (No. 30), Runcorn U.D. (No. 7), Altrincham B. (No. 10),

Colne B. (No. 9), Urmston U.D. (No. 11), Wallasey C.B. (No. 16), Audenshaw U.D. (No. 6), Bury C.B. (No. 9), Accrington B. (No. 10).

### East Midlands

Carlton U.D. (Nos. 9 and 10), Hucknall U.D. (No. 4), West Bridgford U.D. (No. 1), Arnold U.D. (No. 5), Beeston and Stapleford U.D. (No. 13), Derby C.B. (No. 21).

### West Midlands

Sutton Coldfield B.C. (No. 21), West Bromwich C.B. (Nos. 20 and 21), Stourbridge B.C. (No. 28), Halesowen B.C. (No. 34), Birmingham C.B. (Nos. 157 and 158).

### Greater London

Brent L.B. (Nos. 9 and 11), Bromley L.B. (Nos. 16, 17 and 18), Hillingdon L.B. (Nos. 16 and 17), Harrow L.B. (No. 25), Kingston-upon-Thames L.B. (Nos. 20 and 21), Merton L.B. (Nos. 20 and 21), Newham L.B. (No. 8), Wandsworth L.B. (No. 5), Southwark L.B. (Nos. 27 and 28), Sutton L.B. (Nos. 23 and 25), Barnet L.B. (No. 13), Hillingdon L.B. (No. 13), Hounslow L.B. (Brentford and Chiswick No. 12), Lambeth L.B. (No. 25).

### Outside the Black Areas

Bedworth U.D. (No. 4), Canterbury C.B. (No. 1), Cheshunt U.D. (No. 7), Gravesend B.C. (No. 2), Leamington Spa R.B. (Nos. 11 and 12), King's Lynn B. (Windsor Road; Seabank and Hillington Square), Marple U.D. (Nos. 3, 4 and 5), Norwich C.B. (Nos. 2 and 3), Ramsbottom U.D. (Nos. 4 and 5), Reading C.B. (No. 17), Saltburn and Marske U.D. (Nos. 2 and 3), Thurrock U.D. (No. 8), Whiston R.D. (No. 4; Rainhill No. 2 and Knowsley No. 2), Harrogate B.C. (No. 1), Easington R.D. (Peterlee No. 2), Blaby R.D. (Braunstone), Bletchley U.D. (No. 1), Luton C.B. (No. 9), Seisdon R.D. (No. 2), Meriden R.D. (No. 6), Northampton C.B. (Nos. 3, 4, 5, 6, 7 and 8), Oxford C.B. (No. 11), Slough B.C. (No. 14), Basildon U.D. (No. 9), Crawley U.D. (Pound Hill), Doncaster R.D. (No. 1), High Wycombe B. (No. 18), Hazel Grove and Bramhall U.D. (No. 7), Southampton C.B. (No. 12), Stocksbridge U.D. (No. 1), Grantham B. (No. 19).

## NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

### Northern

Gateshead C.B. (No. 14), Darlington C.B. (No. 8), Jarrow B.C. (Nos. 7 and

8), Teesside C.B. (Nos. 9B; No. 10; 'C'; 'D'; 'E'), Boldon U.D. (No. 20), Gosforth U.D. (No. 3), Hartlepool B.C. (No. 23), Hebburn U.D. (No. 14), Whickham U.D. (No. 11).

### Yorkshire and Humberside

Rotherham C.B. (Blackburn), Elland U.D. (West Ward), Heckmondwike U.D. (No. 9), Kingston upon Hull C.B. (No. 12), Leeds C.B. (Nos. 107, 108, 109 and 110), Brighouse B. (No. 17), Huddersfield C.B. (Fartown-Fixby).

### North West

Bolton C.B. (Bradford Ward and West Ward No. 5), Audenshaw U.D. (No. 7), Blackburn C.B. (No. 12), Droylesden U.D. (No. 16), Tyldesley U.D. (No. 4), Birkenhead C.B. (No. 19), Crompton U.D. (No. 6), Eccles B. (No. 17), Farnworth B. (No. 6), Little Lever U.D. (No. 2), Manchester C.B. (Mount Road), Middleton B. (No. 19).

### West Midlands

Coventry C.B. (No. 16), Halesowen B. (No. 36), Birmingham C.B. (No. 160), Stoke-on-Trent C.B. (No. 26), Stourbridge B. (No. 31), Sutton Coldfield B. (No. 25), Warley B. (No. 10), Wolverhampton C.B. (No. 17), Aldridge-Brownhills U.D. (No. 35), West Bromwich C.B. (Nos. 22 and 23).

### Greater London

Harrow L.B. (No. 27), Lambeth L.B. (No. 28).

### Outside the Black Areas

Burton-upon-Trent C.B. (No. 3), Crewe B.C. (No. 5), Grantham B.C. (No. 21), Meriden R.D. (No. 7), Stanley U.D. (Co. Durham) (No. 3), Hale U.D. (No. 4), Lees U.D. (No. 1), Rugby B.C. (No. 15), Southampton B.C. (No. 13), Worksop B.C. (No. 2), Hebdon Royd U.D. (Fairfield Ward—part) Letchworth U.D. (part of Wilbury Area), Ramsbottom U.D. (No. 6), Reading C.B. (No. 18), Tamworth B.C. (No. 8), Whitley Bay B.C. (No. 9).

## NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

### Northern

Teesside C.B. (Nos. 11, 12, 13 'G' and 'F'), Darlington C.B. (No. 9), Sunderland C.B. (Nos. 9, 10 and 11), Tynemouth C.B. (Nos. 14, 15, 16 and 17), Jarrow B.C. (Nos. 9 and 10), Hebburn U.D. (No. 15), Gateshead C.B. (No. 15), Wallsend B.C. (No. 7), Gosforth U.D. (No. 4).

**Yorkshire and Humberside**

Conisbrough U.D. (Nos. 2, 3 and 4), Barnsley C.B. (Nos. 15, 16 and 17), Pudsey B.C. (Nos. 12 and 13), Wath-upon-Deane U.D. (Nos. 6 and 7), Bradford C.B., Huddersfield C.B. (Bradley Plain), Sowerby Bridge U.D. (Nos. 11 and 12), Stanley U.D. (South Stanley No. 3), Wakefield C.B. (St. John's No. 2 and Sandal No. 4), Morley B.C. (No. 43).

**North West**

Birkenhead C.B. (Nos. 9 (Thingwall), 15, 16 and 18), Heywood B.C. (No. 11), Rochdale C.B. (Mayfield and Halifax Road), Runcorn U.D. (No. 9), Westhoughton U.D. (No. 18), Middleton B.C. (No. 18), Wallasey C.B. (No. 17), Ashton-under-Lyne B.C. (No. 15), Darwen B.C. (No. 12), Stalybridge B.C. (Brushes Estate and Huddersfield Road/Copley Estate), Irlam U.D. (No. 6), Blackburn C.B. (No. 13), Stockport C.B. (Heaton Moor/Heaton Norris), Wigan C.B. (No. 9), Manchester C.B. (Moston), Prestwich B.C. (No. 10A), Hyde B.C. (No. 9), Little Lever U.D. (No. 3), Accrington B.C. (No. 12), Farnworth B.C. (No. 7), Failsworth U.D. (No. 11), Leicester C.B. (Nos. 31, 32 and 33), Preston C.B. (Nos. 26, 27 and 28), Urmston U.D. (No. 12), Fulwood U.D. (No. 4), Eccles B.C. (No. 18).

**East Midlands**

Alfreton U.D. (No. 7), Chesterfield B.C. (No. 7), Carlton U.D. (No. 11), Nottingham C.B. (No. 6), Ilkeston B.C. (No. 8).

**West Midlands**

Sutton Coldfield B.C. (No. 24), West Bromwich C.B. (No. 24), Bedworth U.D. (No. 5).

**South West**

Bristol C.B. (Nos. 9 and 11).

**Greater London**

Merton L.B. (Nos. 24 and 25), Barnet L.B. (No. 14), Waltham Forest L.B. (No. 17), Brent L.B. (Nos. 12 and 13), Kingston-upon-Thames L.B. (No. 22),

Harrow L.B. (No. 13A), Wandsworth L.B. (No. 6), Lambeth L.B. (No. 29), Hillingdon L.B. (Nos. 18, 19 and 20), Newham L.B. (Nos. 9 and 10), Sutton L.B. (Nos. 26 and 27).

**Outside the Black Areas**

Cambridge B.C. (No. 3), Worksop B.C. (No. 1), Consett U.D. (No. 1), Runcorn R.D. (No. 7), Skipton R.D. (Sutton No. 2), Thurrock U.D. (No. 9), Glossop B.C. (No. 6), Hazel Grove and Bramhall U.D. (No. 8), Hemel Hempstead C.B. (No. 2), Belper R.D. (No. 4), Lincoln C.B. (Nos. 5 and 6), Hemsworth R.D. (South Kirkby No. 1), Seaton Valley U.D. (No. 2), Longdendale U.D. (No. 1), Southwell R.D. (No. 2), Easington R.D. (Peterlee No. 3), Whiston R.D. (Central Area), Leyland U.D. (No. 1), Harrogate B.C. (No. 2), Whitley Bay B.C. (No. 10), Stocksbridge U.D. (No. 2), Stevenage U.D. (No. 1), Royal Leamington Spa (No. 13), Swadlincote U.D. (Nos. 5 and 6), Potters Bar U.D. (No. 5), Colne Valley U.D. (Nos. 2 and 10), Cheshunt U.D. (No. 8), Doncaster R.D. (No. 2), Saltburn and Marske-by-the-Sea U.D. (Nos. 4 and 5), Bletchley U.D. (No. 2), Exeter C.B. (Beacon Heath), Wellington U.D. (Salop) (No. 2), Slough B.C. (No. 15), Guildford B.C. (No. 1), Luton C.B. (Nos. 10 and 11), Ripley U.D. (No. 3), Marple U.D. (No. 6), Skelmersdale and Holland U.D. (No. 8), Warrington R.D. (No. 9).

**NORTHERN IRELAND**  
**NEW SMOKE CONTROL ORDERS**  
**IN OPERATION**

Belfast C.B. (Nos. 8 and 10), Castle-reagh R.D. (No. 6), Holywood U.D. (No. 4), Lurgan B.C. (No. 4), Newtownabbey U.D. (Nos. 5, 6 and 7).

**NEW SMOKE CONTROL ORDERS**  
**CONFIRMED BUT NOT YET IN**  
**OPERATION**

Antrim R.D. (No. 2), Hillsborough R.D. (No. 3).

**NEW SMOKE CONTROL ORDERS**  
**SUBMITTED BUT NOT YET**  
**CONFIRMED**

Castlereagh R.D. (No. 7), Craigavon D.C. (No. 1 (Var B)), Lurgan B.C. (No. 5).

**SCOTLAND**  
**NEW SMOKE CONTROL ORDERS**  
**IN OPERATION**

Clydebank (Whitecrook No. 9), Dundee (Fintry), East Kilbride (South West Extension and South East Extension), Falkirk (No. 10), Galashiels (Tweed Road/Buckholm), Glasgow (Kelvinside), Port Glasgow (No. 7).

**NEW SMOKE CONTROL ORDERS**  
**CONFIRMED BUT NOT YET IN**  
**OPERATION**

Clydebank (No. 10 South), Dunbarton County (Hardgate/Duntocher), Edinburgh (Colinton No. 2), Hawick (Lynnwood), Paisley (Blackstoun No. 14), Port Glasgow (No. 8).

**NEW SMOKE CONTROL ORDERS**  
**SUBMITTED BUT NOT YET**  
**CONFIRMED**

Dumfries (Georgetown), Lanark County (Blantyre West and Bankhead No. 2), Renfrew County (Houston New Community).

**Erratum**

Page 39, "Clean Air" Winter. Smoke Control Areas, column 2—Smoke Control Orders Submitted, the acreage should read 41,994 and the grand total acreage should read 1,175,024.

Page 41, "Clean Air" Winter. Smoke Control Progress at 30 September 1972. Column 2—outside black areas should read 203,516 and the grand total acreage should read 1,175,024.

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## Pollution in Town Air

A course on pollution in town air will be held at Ipswich Civic College on Thursday, 24th May. The course fee will be £3.50 and further details may be obtained from Mr. H. S. Hunt, Head of Science Department, Ipswich Civic College, Rope Walk, Ipswich. Tel: Ipswich 55885.

"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## U.S.A.

Less noise, safer food and cleaner oceans should result from three bills signed into law by the President recently.

The Noise Control Act of 1972 is the first major attempt to establish safe sound levels for many categories of noise producers, including construction and transportation machinery, motors and engines, and electronic and electric equipment.

The act also requires the Environmental Protection Agency to make a nine month study of aircraft noise problems which will result in regulations for legislation on the problem. In all, the act commits 21 million dollars over three years to the problem of reducing noise pollution. It also allows for citizen suits against the government and others who fail to follow mandatory requirements, with fines of up to 25,000 dollars per day and one year in prison for offenders.

## WORLD METEOROLOGICAL ORGANIZATION

### WMO/WHO Technical Conference on Observation and Measurement of Atmospheric Pollution

A Technical Conference on the Observation and Measurement of Atmospheric Pollution (TECOMAP) will be held in Helsinki, Finland, from 30th July to 4th August 1973. The Conference will be co-sponsored by the World Health Organization and will immediately precede the sixth session of the WMO Commission for Instruments and Methods of Observation, also to be held in Helsinki, from 6th to 18th August, 1973. An international instrument exhibition (METEOREX 73) will be organized by the host country from 2nd to 9th August, 1973.

It should be noted that, according to WMO classification, this technical conference is classified as type (a), namely, a conference "in which participants are not formally nominated by Members, intended for dissemination and exchange of information and which does not make formal recommendations".

The programme will include the following topics:

- I. Requirements for measurement of air pollutants and atmospheric constituents for forecasting of pollution potential, health, agriculture, and research in climatic change. Specific requirements for accuracy, frequency and density of observations.
- II. Measurement, observation and chemical analysis of pollutants on the urban scale. Techniques for measuring and monitoring at high concentration levels. Siting criteria for observation stations. Constituents important for health, physical and biological effects.

- III. Measurement, observation and chemical analysis of pollutants on the regional and global scales. Techniques for measuring and monitoring at low concentration levels. Siting criteria for observation stations. Constituents important for climatic change.
- IV. Turbidity and radiation measurements as tools for measuring and monitoring atmospheric pollution (ground based, airborne and satellite).
- V. Topics of special interest to include:
  - (a) Measurements of the low-level distribution of atmospheric parameters by direct and indirect means;
  - (b) Dry and wet deposition of pollutants;
  - (c) Methods of standardization and intercomparison.

Presentation of papers is invited on any of the themes outlined in the foregoing paragraph. Only original contributions within the framework of the programme of the conference will be accepted. Individuals wishing to participate in the conference are requested to make a provisional registration prior to 1 March 1973. The request form and the title and abstract of any paper proposed for submission should be sent to:

Co-ordinator of TECOMAP  
World Meteorological Organization  
Case postale No. 1  
CH-1211 GENEVA 20

with a copy to the Permanent Representative.

## UNITED NATIONS

### U.N. Environment Effort Concludes Historic Year and Prepares for Action in 1973

Environmentalists are looking forward to 1973 as the year in which the United Nations will launch practical international action to protect the global environment.

Officials of the new United Nations Environment Programme, working with a mandate outlined by the United Nations Conference on the Human Environment in June 1972, and endorsed by the General Assembly in December, are finalizing details for initial environmental projects.

These include an "Earthwatch" environmental monitoring system, an International Referral Service for sources of environmental information and a "genebank" for conserving threatened plant species.

Nairobi, the capital of Kenya, has been selected as headquarters for the Environment Programme—the first time a central United Nations body has been located in the Third World.

Maurice F. Strong, the Canadian industrialist and civil servant who guided more than two years of preparation for the Human Environment Conference held in Stockholm, has been elected by the General Assembly to a new post as Executive Director of the United Nations Environment Programme.

The General Assembly also established a 58-nation Governing Council to oversee United Nations work in the environment field and named 5 June, the opening day of the Stockholm Conference, as World Environment Day. An Environment Fund, expected eventually to reach \$100 million for the first five years' activities, has been established to finance United Nations environment work. Member States have already pledged nearly \$60 million to the Fund.

Now, environment Programme Officers are preparing to put the resolutions of 1972 into action. A small advance party of the Programme staff will arrive in Nairobi in the first months of 1973. By October the Nairobi headquarters contingent is expected to number between 50 and 70, and liaison units will be set up in New York and Geneva. Some \$2 million has been budgeted to administer the environment Programme in 1973 and for the first Governing Council meeting in June.

### Possible Projects

The "Earthwatch", one of the most important projects studied for recommendation to the Governing Council at its first meeting in June, will be a monitoring system to carry out continuous measurement of levels of pollutants of international significance on a global scale. Preliminary planning calls for detailed work on identifying pollutants and discussions on the design of the Earthwatch system. Experts hope that the scheme could be in operation by 1974 and, eventually, include key research stations to watch over 10 climatic and geographical regions from the tropics to the polar ice caps.

Another high priority project is the establishment of a computerized International Referral Service that would make available to Governments and members of the United Nations system, existing information about local, national and international research in the environment field. Also available would be information on environmental legislation and management experience in a form that would include the name, address, cable and telephone number of the information source, together with details of the controlling body, function, subject coverage, services and availability.

Environment Programme officials are also considering a "gene-bank" for the collection and conservation of plant genetic resources. As cultivated plant species comprise an increasingly limited sample of the genetic diversity of the species from which they were developed, biologists believe that the plants in use, many of them major food species, are more vulnerable to devastation from pests and diseases. The "gene-bank" would make available varieties of plants for quick use in re-establishing genetic resistance, particularly in cereals but also in fruits, vegetables and other crop species. Project plans suggest the establishment of nine regional centres, based on existing institutions to explore, survey, collect, con-

serve or exchange such species. Among plants to be given priority attention are: African forest and grain species, Andean potatoes and Asian legumes.

## MEXICO

At the request of the British Embassy in Mexico, the Birmingham Chamber of Commerce and Industry in collaboration with the Department of Trade and Industry is to sponsor a one-week technical Mission to Mexico with the emphasis on suppliers of goods and services associated with pollution control equipment.

Mexico has quickly become aware of the inbuilt and sometimes unseen hazards of the many types of pollution and is now taking active steps to control the situation. With this in mind, the British Embassy in Mexico considers that a visit of U.K. specialists who provide goods and services connected with the wide sphere of pollution would be timely. Already, many U.K. companies are engaged in this work not only in Mexico but other parts of Latin America. Nevertheless, the Chamber and the Embassy feel there is much more which can be done to enable Mexico to benefit from the technical know-how of U.K. companies.

Certainly there will be competition, especially from North America and Japan but the Chamber is confident that U.K. firms can meet the other countries who are watching developments in Mexico on equal terms.

The Mission will leave the U.K. on Friday, 22nd June and will be based in Mexico for one week. In addition to group activities, the British Embassy will, if required, draw up individual programmes and provide contacts with Mexico's decision-takers in this sphere.

## NORWAY

Norway is planning what is likely to be Scandinavia's largest and most comprehensive exhibition of products and services for environment protection and ecology. To be known as MILJØ 73, the exhibition will be staged at Trondheim, Norway, from June 26th-29th under the auspices of Norway's Royal Ministry of the Environment and the Technical University of Norway. MILJØ 73 will be open to exhibitors from all over the world and applications for the display of equipment produced in West and East European countries, Japan and the U.S.A. have already been received.

The Norwegian Chemical Association, which has about 2,000 members and is Norway's principal association of chemists and chemical engineers, will hold its national meeting in conjunction with the exhibition. Also, the Environmental Protection Committee of the Technical University of Norway, representing the Royal Norwegian Society of Sciences and the Engineering Research Foundation, will organize an environmental protection symposium. Delegates are expected from official and private institutions in Norway and abroad.

# Third International Clean Air Congress

## Dusseldorf, West Germany

8th to 14th October 1973

The Third International Clean Air Congress, organised by Verein Deutscher Ingenieure, Kommission Reinhaltung der Luft, will be held in the Congress Centre, Neue Messe, Rotterdamer Strasse, Dusseldorf from Monday, 8th October to Friday, 12th October, 1973. "Envitec", an exhibition dealing with all forms of pollution control will be held in conjunction with the Congress from the 8th to 14th October.

The detailed programme has not yet been announced, but papers on the following subjects will be presented by leading speakers from all over the world:

### 1. Principal subjects

- 1.1 Means and technical methods for the reduction of air pollution in heavily polluted regions
- 1.2 Ways of controlling air pollution in new plants (including technical design and administrative regulations)
- 1.3 Clean air through new technologies (pollution-free plants, harmless raw materials and products)
- 1.4 Education and training; public relations

### 2. Profile subjects

- 2.1 Influence of meteorological factors on air pollution
- 2.2 Physics and chemistry of atmospheric pollutants
- 2.3.1 Criteria for the determination of the effects of air pollution (effects on health, animals, vegetation and materials)

- 2.3.2 Air quality criteria and standards
- 2.4 New systems of measurement (Emission and environment)
- 2.5 State of differing national legislation: the technical and economic consequences resulting therefrom
- 2.6 Role of fiscal policies and taxation in fighting air pollution
- 2.7 Clean air through regional and urban planning

### 3. Branch subjects

- 3.1 Combustion for domestic heating and industries
- 3.2 Combustion in power stations
- 3.3 Air pollution from road vehicles and aircraft
- 3.4 Mining (including processing, e.g. coking plants, briquette factories)
- 3.5 Cement, lime, brick and ceramic industries and building techniques
- 3.6 Iron and steel industry, nonferrous metal smelters, remelting works, foundries
- 3.7 Chemical industry
- 3.8 Petrochemical industry, refineries
- 3.9 Agriculture and animal husbandry
- 3.10 Waste disposal and recovery

The programme will include a number of technical and social visits and a selection of sightseeing tours. A special programme for ladies is being arranged.

Details of registration may be obtained from the National Society for Clean Air, 136 North Street, Brighton BN1 1RG.

## Air Pollution and Meteorology

A course on Air Pollution and Meteorology will be held from 1st-7th September, 1973, at University Hall, Cardiff. Directed by M. P. Paterson and R. A. Cox of Imperial College, London. The course is designed for people with a professional or amateur interest in air pollution, its study and control. Lectures and discussion in the morning throughout the week will prepare the participants for outdoor studies during the afternoon. Some prior knowledge about meteorology or air pollution phenomena will be useful but is by no means essential.

Topics to be covered in lectures and, where possible, field work are:

Constituents of the natural atmosphere and their controlling mechanisms.

Weather patterns, temperature stratification and turbulence in the air near the ground.

Topography, coastlines and local winds.

Species of pollutants, their origins, impact and natural removal

Control by planned dispersion and by removal at source.

The nature of urban sources of air pollution.

The nature of industrial sources.

Information available from meteorological and air pollution records.

Air pollution considerations in industrial and town planning.

The fee for the course will be £25 including accommodation with full board. Discounts are available to school and university students on request. Applications should be addressed to M. P. Paterson Esq., Air Pollution Research Group, Department of Mathematics, Imperial College, London SW7.

# National Society for Clean Air

134-137 North Street, Brighton BN1 1RG (Brighton 26313)

*President:* Stanley E. Cohen, C.B.E., C.C., F.R.S.A.

*Immediate Past-President:*  
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Miss M. George, M.B.E.

*Director:*  
Rear-Admiral P. G. Sharp, C.B., D.S.C.

## *Divisional Honorary Secretaries:*

### **SCOTTISH**

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### **NORTHERN IRELAND**

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### **NORTH-EAST**

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### **YORKSHIRE**

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### **EAST-MIDLANDS**

E. F. Raven, Divisional Inspector, Smoke Control, Public Health Dept., County Borough of Derby, Castlefields House, Main Centre, Derby DE1 2FL (Derby 31111)

### **WEST-MIDLANDS**

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### **SOUTH-EAST**

R. F. Shapter, F.A.P.H.I., Public Health Dept., 8 Easton Street, High Wycombe (High Wycombe 26100)

### **SOUTH-WEST**

J. Barnett, Chief Public Health Inspectors' Office, Union House, Union Street, Bristol BS1 (0272 26241).

### **SOUTH WALES and MONMOUTHSHIRE**

L. Morgan, 9 Lodge Drive, Baglan, Port Talbot (5231)

The parent of the Society was the Coal Smoke Abatement Society, established in London in 1899. It did valuable pioneering work and accomplished the first necessary stage of making it understood that clean air was not the pet notion of a few cranks. It co-operated with a provincial association that had been formed in 1909—the Smoke Abatement League of Great Britain. These two bodies amalgamated in 1929 to form the National Smoke Abatement Society. This name was retained until 1958, when it was changed to the present one.

From a handful of individuals the Society's membership has grown to include not only considerable private membership both at home and abroad, but membership of local authorities, corporate bodies, (representing the Learned Societies and Institutions),

the fuel industries and those industries concerned with the production of appliances and equipment connected with clean air.

The Society is a voluntary body and receives no official grant, and therefore essentially subsists on the subscriptions of its members. The general policy of the Society is Directed by the Executive Council and its Committees. There are twelve Divisional Councils of members, with their own committees and honorary officers.

The Society's objects are, in brief, to promote and create by publicity and education an informed public opinion on the value and importance of clean air and to initiate, promote and encourage the investigation and research into all forms of atmospheric pollution in order to achieve its reduction or prevention.

## Membership of the Society and Subscriptions

Membership of the Society is open to any individual, corporate body or local authority. Subscription rates are given below.

### **Individual Members**

Not less than £3. Subscriptions can be paid by Covenant, minimum of seven years at £1.83, the balance being recoverable from the Inland Revenue by the Society. Those Members wishing to pay their subscription by Bankers order or wish to Covenant with the Society are requested to apply for the necessary forms for completion.

### **Local Authority Members**

Population	£	
Less than 25 000	10	appointing 2 representatives
25 001 to 50 000	13	appointing 2 representatives
50 001 to 75 000	17	appointing 2 representatives
75 001 to 100 000	23	appointing 3 representatives
100 001 to 175 000	35	appointing 3 representatives

175 001 to 250 000	40	appointing 4 representatives
250 001 to 375 000	45	appointing 4 representatives
375 001 to 500 000	50	appointing 5 representatives
Over 500 000, £15 and 1 additional representative for each additional 1 000 000 of population or part thereof.		

### **Corporate Members**

Not less than £40 (appointing 4 representatives and 2 delegates in each appropriate division) or not less than £23 (appointing 2 representatives and 1 delegate in each appropriate division)

### **Associate Members**

Not less than £3

*Note:* The Society's subscription year commences 1st April.

National Society For Clean Air

# NEWS FROM THE DIVISIONS

## NORTH EAST

For a considerable period of time, almost indeed, since the introduction of smoke control, the Northern Region has been somewhat backward in implementing the smoke control area provisions of the Clean Air Act. Ever since progress reports were included in *Clean Air* and formerly in "Smokeless Air" the Northern Region has held a lowly place near the bottom of the industrial regional "clean air table" in respect of progress in smoke control.

That this unhappy situation had not escaped official notice was indicated when the Clean Air Council at its meeting in February last appointed a panel of members, to whom were added representatives of local authorities in the Northern Region, to examine the situation. The Panel were asked to examine progress of domestic smoke control in the "black areas" of the region, to suggest improvements, so far as practicable, and to advise the Clean Air Council upon any further steps which should be taken to this end.

The Panel visited the region on four occasions and received written and oral evidence from representatives of the 19 "black" local authorities. The Panel had a further two meetings in London before the Clean Air Council considered the final report at their meeting on the 13th October last.

In due course on 8th November 1972 the report was presented by the Chairman of the Panel, Alderman Mrs. P. Sheard, C.B.E., B.A., J.P., to Mr. Eldon Griffiths, M.P., Under-Secretary of State at the Department of the Environment and it was, therefore, very fitting that, at a meeting of the North East Division arranged for the 10th November, the report should form the main subject of discussion.

At this meeting, which was held in the Park Hotel, Tynemouth, members were guests of the Corporation of Tynemouth C.B. and an official welcome was given to the 63 delegates attending by the Mayor of Tynemouth, Councillor Harold Sowerby, J.P. It was also a particularly signal occasion as the Director, Rear Admiral P. G. Sharp, C.B., D.S.C., was present both as Director and member of the Clean Air Council, to deliver an address entitled "An Investigation into Smoke Control Progress in the Northern Region". Admiral Sharp was a very active member of the Investigation Panel and all delegates, particularly those associated with the 19 "black area" authorities, had looked forward with interest to this meeting ever since it was learned that the Director would be present.

The Director dealt in detail with the background against which the Investigation Panel had been appointed by the Clean Air Council and explained the reasons behind the requests for written evidence, later supplemented by oral evidence. He referred to oral evidence taken from other organizations such as the Northern

Economic Planning Council, the Coal, Electricity, Gas and Oil Industries and the District Alkali etc. Inspector for the North East. In evidence submitted by local authorities the supplies of solid smokeless fuels, the inadequacy of the present grant arrangements and the restrictive effect of smoke control being financed from locally determined expenditure were factors very much in the minds of laggard authorities. The speaker dealt at length with these features, particularly the financial problems associated with local expenditure, and he went on to explain why a more positive and satisfactory recommendation could not be obtained for inclusion in the report. Nevertheless, although it had not been possible to achieve unanimous agreement on the question of smoke control being transferred to the key sector of expenditure, the speaker expressed the hope that the recommendation, that the Department of the Environment should be ready to enter into negotiations with any particular local authority with a view to solving or easing the financial problems involved in smoke control programmes, would be effective in securing the acceleration of smoke control in those districts experiencing financial difficulties.

It was inevitable that reference in the report to the use of compulsory powers by the Secretary of State would arouse feelings of antagonism in certain quarters, but the Director was particularly painstaking in explaining why this somewhat drastic recommendation had been included. He emphasised that it was only in respect of a minority of laggard authorities that recommendations for compulsory powers should be adopted and he expressed the hope that a voluntary acceleration of smoke control work in those authorities would render such formal action unnecessary. Indeed, he mentioned that the mere fact of the institution of the Panel itself in its investigatory role had already had a remarkable effect in accelerating smoke control work in the various parts of the region and he offered the hope, which was surely shared by all present, that as a result of renewed efforts the Northern Region would raise itself from its lowly place in the smoke control progress league table which it had occupied for so long.

A prolonged and very vigorous discussion ensued and although all the questioners might not have agreed in detail with some of the views expressed by the speaker, there is little doubt that the Director's address had explained many points and outlined the circumstances which justified this official investigation.

After a vote of thanks proposed by Mr F. G. Sugden of Teesside C.B. the Director had hurried refreshments with the Mayor of Tynemouth and was transported to Newcastle to catch his return train for the long journey home.

L. Mair  
Hon. Secretary

## SOUTH WEST

The autumn meeting of the Division was held on the 28th November 1972 at Avonbank, the new Headquarters of the Bristol District of the South Western Electricity Board. The Divisional Council met in the morning and reports were presented on the Annual Conference at Scarborough and the meeting of Chairmen and Honorary Secretaries by the Secretary who represented the Division at Conference; recommendations from a Sub-Committee of the Divisional Council with regard to the 1973 Annual Conference to be held at Torquay were considered, and discussion took place on the question of Divisional representation upon the Executive Council, and the facilities available in the south west for the incineration of waste material. At the conclusion of the morning's business the Divisional Council were entertained to lunch by kind invitation of the Bristol District Manager of SWEB.

The Divisional meeting took place in the afternoon and after a short business meeting to which representatives of two new local authority members, Somerset County Council and Warmley RDC, were welcomed, Mr. Brian Weston of SWEB presented a short paper on the principle of integrated environmental design upon which the Avonbank offices were designed. Although this is mainly concerned with the working environment, it is relevant to the total environment because a large building is heated with no contribution to environmental pollution; it is therefore of interest to members of the National Society for Clean Air.

In introducing his paper Mr. Weston stated that approximately 35 buildings designed on this principle have been completed, one of the first of which was Avonbank, and another 70-80 are now under construction. These consist mainly of office blocks but also include public buildings such as libraries. The outstanding feature of the building is that it has its own built-in climate; there is no distracting glare from oversize windows, no traffic noise, no dark corners, no draught and interior noise is reduced to an acceptable level. Lighting, temperature, and air conditioning are all precisely controlled, summer and winter. One of the problems the designers were anxious to overcome was solar glare, and it was decided to restrict glazed areas to a minimum. The three-storey building is a simple rectangular structure and the windows, which are double glazed, constitute only 15 per cent of the internal wall surface.

Research has already proved conclusively that the higher the level of illumination, provided there is no glare, the less will be the fatigue, particularly at the end of the day. In the office areas the minimum level of illumination chosen was 1,000 lux with a lower level at the circulation and service areas. The heat from the lighting is recovered to warm the building when required. This level of illumination is provided by fluorescent lighting in specially designed fittings which enable air to be drawn around the tubes and into the plenum system. This enables the temperature of the tube wall to be kept near its design temperature of 40°C with a resultant 12 per cent increase in light output from each tube, which means that the desired lighting level is achieved with 12 per cent fewer tubes than would normally be required.

With a level of illumination of 1,000 lux in the office areas, an electrical loading of 45 watts per square metre (4.18 watts per sq. ft.) was necessary. Of this energy,

at least four-fifths is given off immediately as heat, the remaining one-fifth appearing as light. Even so, the light energy is eventually converted into heat so that the whole of the input energy had to be taken into account when considering the temperature conditions within the offices. By harnessing the heat given off by the lighting, office machines, air conditioning pumps, sub-station transformer, and people (the heat in some parts of the building during occupation is always more than that required to maintain the design temperature even in the depth of winter) and distributing it to parts of the offices requiring heating, no supplementary heating is required except during severe cold spells.

With the deep building, cooling is required in the central areas during the whole of the periods of occupation—winter and summer—and in the perimeter areas heating or cooling is required depending upon the outside temperature. The demand for cooling necessitates an air conditioning system, and the need for varying air temperature treatments in different parts of the office leads automatically to a system of zones each with its own thermostat and air temperature control device. The air conditioning system has been designed to maintain an internal temperature of 21°C (70°F) all the year round and the humidity is also controlled to a comfortable level.

The centrifugal fans in the air handling units draw the air from the sealed ceiling plenum. The air into the plenum is drawn from the offices through the lighting troughs, and in passing through the troughs it picks up heat from the fluorescent tubes and control gear. This air is filtered, heated or cooled at the heat exchanger according to the demand of the zone thermostat, fresh air is added and the conditioned air returned to the offices. The fresh air supply is filtered for both dust and smells, cooled or heated and humidified at the central plant room on the roof and supplied in fixed quantities to each zone air handling unit. Heat is recovered from those areas calling for cooling and transferred to those areas that require heating. As the air to be cooled passes over the heat exchanger, heat is transferred from the air to the water. This water is returned to the refrigeration machine and heat transferred via the condenser direct into the hot water circuit, this water then being offered to those areas calling for heating.

Two standard refrigeration machines operate in series to provide chilled water. The condenser recovers heat for use in the building when it is required. When not required for immediate heating, the heat is stored as hot water and when the storage cylinder is fully charged, the excess heat is dispersed through the cooling tower. Due to the small preheating requirement (needed only on very cold mornings before the staff arrive) and the extremes of external temperature which the system can meet, it is unnecessary to provide a boiler house and flue. Immersion elements are fitted into the storage cylinder to raise the temperature of the stored water, when required, by cheap off-peak electricity.

At the end of Mr. Weston's paper members toured the building and their questions were answered by Mr. Weston and his colleagues during tea which was kindly provided by SWEB.

*J. Barnett  
Hon. Secretary*

## Letters to the Editor

The Editor,  
Clean Air  
Sir,

The Clean Air Year Book for 1973 contains the statement that "asbestos can no longer be considered to be merely a pollutant of industrial atmospheres. Recent work on the prevalence of mesotheliomas has shown the need to study it as an urban pollutant". We should therefore draw to your attention the report of the Advisory Committee on Asbestos Cancers to the Director of the International Agency for Research on Cancer, following its meeting on the Biological Effects of Asbestos held in Lyon in October 1972.

In their general review of the asbestos/health situation the following question and answer appeared:

"Is there evidence of an increased risk of mesothelial cancers at low levels of exposure to asbestos, such as have been encountered by the general population in urban areas?"

There is evidence of an association of mesothelial tumours with air pollution in the neighbourhood of crocidolite mines and of factories using mixtures of asbestos fibre types. The evidence relates to conditions many years ago. There is evidence of no excess risk of mesotheliomas from asbestos air pollution which has existed in the neighbourhood of chrysotile and amosite mines. There are reported differences on incidence of mesothelioma between urban and rural areas, the causes of which have not been established. There is no evidence of a risk to the general public at present."

Measurements of asbestos in urban atmospheres by the Asbestos Research Council in the U.K. have shown that the amount of asbestos fibre detectable in the urban atmosphere is at least 1,000 times less than would be an acceptable asbestos dust concentration for occupational exposure throughout a working lifetime.

Yours faithfully,

A. A. CROSS

The Asbestos Information Committee,  
Park Street,  
London.

The Editor,  
Clean Air

### Town View Sites—In Clean Air.

Sir,

We can now enjoy the view of our home towns, 20 years after London's most fatal smog episode. So wherever towns have suitable hills let us make many free access, public view points.

Many people draw attention to the decrease in murk and grime that they formerly observed in Britain's towns. Some remember that years ago smogs buried communi-

ties under coal smoke and soot. Sheffield was then invisible from its hills; even Scarborough was hidden from its castle by domestic smoke while green country could be seen from the same castle, north and south.

Sheffield is now seen, beautifully, from its hills. The Clean Air Acts of 1956 and 1968 have gradually opened to view vistas of many British towns, now that they are almost free from smoke. Hence the building of clean air view points in our smoke-controlled towns may now be considered well worthwhile.

Many may benefit if members of our Society discuss the feasibility of this suggestion with councillors and local authority officials. With enforced and newly-won cleaner air, town dwellers could enjoy fine views over their home town.

Where can we take our children, and visitors, to behold our town unless land is given or bought for view points or belvederes? Call these Town View Sites what seems most appropriate. Manchester might have its "Charles Gandy Smokeless Zone View". Elsewhere "The Town View", "The Terrace", "The Ridge", "The Mount", "Church View", "Prospect Point", and so on.

But please construct, in our smoke controlled towns, many such free-access, public, view sites. They will do much to make us all better informed citizens, and help to keep our air clean.

More or less panoramic view points may not be easily found and cheaply available (What really good thing is?) but they deserve to be produced with the help of private and industrial generosity, as *thank offerings for clean air and the absence of fatal "pea-soup" smogs.*

T. HENRY TURNER

Carlton Road,  
Derby

Clean Air  
Sir,

At last an article about common or garden bonfires.

I started to complain about this nuisance long before "ecology" and "environment" became household words. I approached my local authority about this suggesting various methods of dealing with the problem. I went as far as offering to purchase, for distribution by the Council, leaflets about composting published by The Henry Doubleday Research Association of Braintree, Essex. I also suggested the regulating of bonfires, the Council to designate certain days of the month as "bonfire days". My suggestions were not even acknowledged.

Nobody need have a bonfire more than once a fortnight to burn the pieces of wood which cannot be composted and if these bonfires are burning ones and not

smoky ones, and restricted to certain times of the day, they need not cause nuisance to people or damage their health (especially those with respiratory troubles).

All we need is Regulating of bonfires.

This would at once do away with the neighbour who has a bonfire burning 365 days a year to spite the complainant.

Could you please start a campaign on these lines?

Yours sincerely,

GISELLE LAX (Mrs.)

*Park Hill Road,  
Shortlands  
Bromley,  
Kent*

*The Editor,  
Clean Air*

#### **The Future Control of Air Pollution.**

Sir,

I have read with interest the two replies in your winter issue to my letter on the above subject.

I agree entirely with Mr. R. Johnson that people affected by pollution expect rapid action but, if this has been achieved, why is it that one still hears the comment that it is a waste of time to complain to a Local Authority? Further, why is it that control of Mineral Works has recently been transferred to the Alkali Inspectorate?

I am aware that some members of the Association of Public Health Inspectors have acquired special knowledge of certain aspects of pollution control and that many hold the Diploma in Air Pollution Control but its syllabus is not adequate for present day needs. The control of air pollution now and in the future requires deep study and this can only come from specialisation by officers with a strong leaning to engineering, mechanical and/or chemical, and Mr. Johnson's case would be stronger if he had stated how many members of the Association had acquired qualifications from the appropriate Engineering Institutions or the Institute of Fuel. I am reliably informed that only about 60 have obtained this level of qualification, which falls short of my suggested requirement of about 100.

Despite Mr. Gregson's suggestion that I should be denied the facilities to express my views. I venture to suggest that he really should not jump to conclusions. I am not contemptuous of Local Government but anxious to see it respected through prompt and efficient action. This can only be secured by having available to advise Councils properly qualified and experienced staff, who spend the majority of their time on the problems involved.

As to ignorance, perhaps I should plead guilty as my experience is limited to 18½ years as a Director of a Company designing, supplying and installing equipment for the prevention of Atmospheric Pollution—nine years as a L.G. Councillor (six with a Rural District Council including Chairmanship thereof) and now on the receiving end of a nuisance from a factory carrying out an Offensive Trade (within the definition of the P.H. Act 1936). The latter has persisted for over seven years and only within the last few days has the Local Authority indicated any possibility of taking legal action.

As to my comments on S.94(5) of the P.H. Act 1936, it will no doubt surprise Mr. Gregson to know that Counsels advice, given comparatively recently, to a Local Authority through its Association was that it would have

little chance of success in an enforcement action if the defendant had carried out all the works that had been requested.

On this occasion, Sir, I venture to subscribe myself.

Yours faithfully,

E. R. WATKINS,  
B.Sc.(Hons.), C.Eng., F.I.Mech.E.,  
Mem. ASME

*The Coach House,  
Chardstock,  
Axminster,  
Devon*

## **Pollution Control Staff Training and Manpower Needs for the Future**

The standing Royal Commission on Environmental Pollution have already published three reports. The First Report, published in February 1971 (Cmd. 4585 H.M.S.O.), surveyed the state of the natural environment in Britain and discussed the choice of priorities for the abatement of pollution. The Second Report (Cmd. 4894 H.M.S.O.), published in March of this year discussed three issues in industrial pollution. The Third Report: "Pollution in Some British Estuaries and Coastal Waters," was published in September (Cmd. 5054 H.M.S.O.).

At their next major study the Commission will review the qualifications, training and certification desirable for the professional and technical staff responsible for controlling pollution, and will try to estimate the future manpower needs for such staff. This was one of the problems which the Commission identified as requiring more attention in their First Report.

The Government's plans for introducing more stringent control of most forms of pollution—notably of waste disposal on land, in tidal waters and in the sea—will place heavy and increasingly technical demands on those who will carry out the tasks. For example, the new local authorities throughout the country, and the new regional water authorities in England and Wales, will assume greater responsibilities for pollution control under new legislation. Such developments make it an opportune time for the Commission to review the tasks and qualifications of existing specialist staffs and the revised scope for specialist staff in the future. The Commission also propose to include in their study a review of any similar demands which may arise in industry.

At the same time the University Grants Committee, together with the Department of Education and Science and the Scottish Education Department, have agreed to collaborate with the Commission's enquiry by collecting information about existing courses, both full-time and part-time, which are at present available for those who wish to take up a career in pollution control, and to advise in due course on any developments which may seem desirable in the light of the Commission's findings.

The Commission will initially invite information and advice from Government Departments and from a number of local and other public authorities with responsibilities within the field of enquiry, as well as from professional institutions and industry. Meanwhile, any other organisation or individual who may wish to assist in the study should write to the Secretary to the Commission, Church House, Great Smith Street, London SW1P 3BL.

# AIR POLLUTION ABSTRACTS

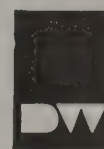
**1281 A Comparison of Chemical Additives as Aids to the Electrostatic Precipitation of Fly-Ash.** Dalmon, J., and Tidy, D. (Atmos. Environ. 6(10), October 1972). Pilot plant electrostatic precipitator experiments have shown that the collection of pulverised fuel ash was aided by a number of additives, including sulphur trioxide, sulphuric acid, ammonium sulphate, ammonium bisulphate, sulphamic acid and, in certain circumstances, ammonia. The first three are economically the most attractive for use in power station precipitators. Sulphuric acid and ammonium sulphate are easily injected in the form of aqueous sprays and the effectiveness of the latter has been confirmed in full-scale tests. Other additives studied were sodium chloride, calcium chloride, sodium sulphate, lithium iodide and hydrogen chloride. Additives improved precipitator performance by increasing the flashover voltage. It is suggested that changes in resistivity due to an additive affected the electron charge on the ash layer, which in turn influenced the surface work function and raised the flashover voltage. Nevertheless, some additives increased the flashover voltage and efficiency without altering resistivity. Where performance correlated with resistivity a better correlation was obtained at an arbitrary bulk density rather than at that of the precipitated layer. The cohesive properties of ash were related to efficiency only when resistivity was low.

**1282 The Objective Calibration and Air Pollution Significance of Ringelmann Numbers.** (Atmos. Environ. 6(10), October 1972). Ringelmann numbers have been used extensively in the control of visible emissions from chimneys. The British Standards Institution have recently issued an addendum to BS 2742 so that measurements of smoke density can be expressed in Ringelmann numbers in a standard manner. For example, Ringelmann 2 is defined as having a percentage obscuration of 64 per cent or an optical density of 0.44. This paper discusses the implications of controlling emissions by Ringelmann numbers and shows that a fixed Ringelmann number allows each source a visible area of plume proportional to the size of the installation and also that if a single plume complies with Ringelmann 2 it is not visible transversely at ground level. These are substantial justifications for the continued use of Ringelmann numbers.

**1283 Emissions, Air Pollution and the Atmospheric Environment.** Garnett, Alice (J. Institut. Fuel (39), January 1973). A programme of continuous daily and hourly pollution sampling (smoke and sulphur dioxide) at a large number of sites in Sheffield, together with the continuous recording of climatological parameters, has been carried out over a number of years in the air pollution research unit attached to the Department of Geography in the University of Sheffield. Some of the results of this work are discussed with reference to case studies for specific days, to demonstrate relationships in the occurrence of high pollution pulses and hourly changes in the stability of the atmosphere as assessed by a lapse rate index. A case of sulphur dioxide levels exceeding  $3,000 \mu\text{g}/\text{m}^3$  is examined with reference to the associated hourly changes in weather parameters. Examples of two days in the month of January experiencing high pressure and calms but dissimilar diurnal pollution patterns are discussed with respect to differences in the nature of the air masses concerned in each case.

**1284 Measurement of Aircraft Engine Pollutant Emissions: a review of Instrumentation, Test, and Sampling Procedures.** Siegel, Richard D. (J. Air Poll. Control Assoc. 22(I), November 1972). An assessment has been made of the state of emission measurement technology to determine whether measurement techniques are sufficiently well advanced to support the development of emission control methods and the implementation of emission standards for aircraft engines. The conclusion drawn from this assessment is that current measurement technology will meet most of the requirements of an emission control programme. Certain measurement techniques are inadequate at present but development of improved techniques appears to be proceeding at a satisfactory rate.

**1285 Solutions for Feedlot Odour Control Problems—a critical review.** Bethea, Robert M. (J. Air Poll. Control Assoc. 22(10), October 1972). This critical review begins with a description of the air pollution and odour control problems associated with animal feedlots and poultry houses. Analyses of odours from these



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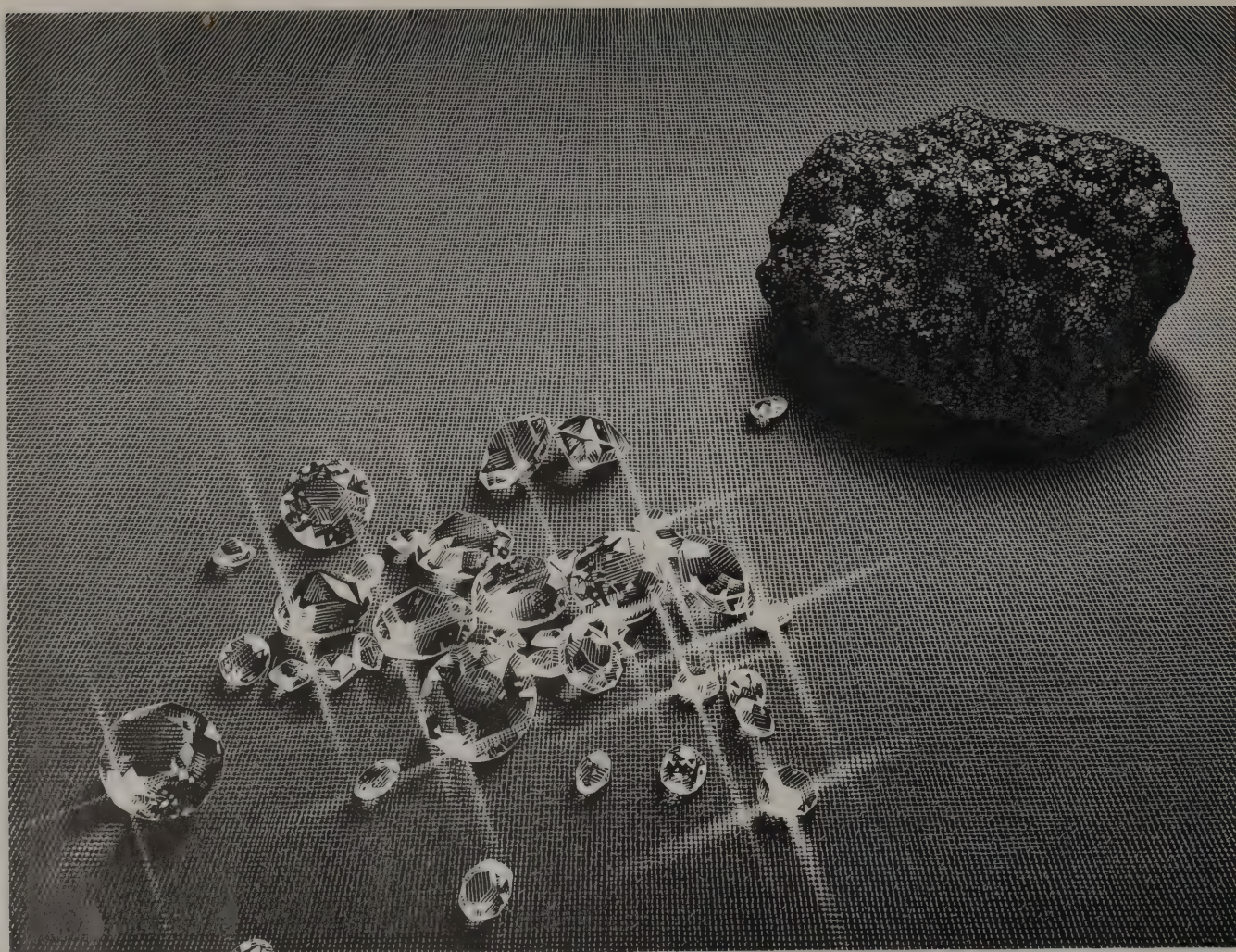
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sources are given with a brief description of the measurement techniques. The effect of waste management schemes on odour production is presented. The following methods of control as applied to excreta are discussed in detail with comparative cost and effectiveness data: odour prevention by modification of feed rations; odour reduction by recycle manure feeding and by improved waste handling procedures; odour control by chemical reaction ozonation gas washing and scrubbing; and odour elimination by thermal and catalytic oxidation. The potential utilisation of the major techniques of controlling rendering plant odours for application to confined animal and poultry feeding operations is discussed in detail. Recommendations for future research in these aspects of agricultural odorous emission control are presented with appropriate outlines for research programmes.



**Coalite, like diamonds, is a form of carbon.  
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Carbon is a pretty surprising element. It turns up in some wild guises. Like diamonds. Men have killed for them. Women have succumbed for them. Fortunes have been founded on them.

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# INDUSTRIAL NEWS

## Site Chosen for U.K.'s First Pollution-free Industrial Estate

Britain's first environmentally controlled, pollution-free industrial estate is being planned for Merseyside.

Liverpool Corporation has announced that it is investigating the development of a completely new-style 'clean estate' which will be designed to provide major benefits for the community plus cost savings for industry.

Work on the project has been initiated with the Corporation's appointment of Environmental Resources Limited, the pollution and environmental planning consultancy, to carry out a feasibility study during the next few months.

The Environmental Resources team undertaking the research consists of some of the U.K.'s leading environmental specialists, including:

Professor A. D. Bradshaw, M.A., Ph.D.—Holbrook Gaskell, Professor of Botany, University of Liverpool.

Mr Neil A. Iliff, a member of the Royal Commission on Environmental Pollution and Senior Environmental Consultant to the Royal Dutch Shell Group of Companies;

Professor Peter C. G. Isaac, Head of the Department of Civil and Public Health Engineering, University of Newcastle-upon-Tyne;

Professor K. J. Ives, Professor of Public Health Engineering, University College, London;

Mr Charles Simeons, M.P., a member of the Parliamentary Scientific and Technical Committee, and Vice-President of the Association of Main Drainage Authorities.

Site of the planned development is at Knowsley, about six miles from Liverpool City Centre, and with easy transport communications—it is seven miles from the docks, eleven miles from Liverpool Airport and nine miles from the M6 motorway.

The Environmental Resources experts will investigate the needs of local communities, in both the social and working contexts, and the requirements of industry, so that they may be co-ordinated and the 'clean estate' planned accordingly.

To achieve economies for industrial organizations, an important aspect of the research will be into the provision of shared environmental facilities such as:

- Treatment of toxic waste
- Solid waste disposal
- Effluent and sewage disposal
- Water treatment and re-cycling
- Materials recovery
- Treatment of air pollution
- District heating and ventilation
- Landscape architecture

In addition, Environmental Resources Limited will seek the views of industrialists, trade unions, water sewage and river authorities, and social and conservationist organizations.

Announcing the project, Mr. James S. Gorie, Industrial Development Officer, Liverpool Corporation, said, "We believe we are the first local government authority in the country to take such a significant step towards achieving a great improvement in total community standards. It is essential that all future industrial development should take into account the importance of environmental health—for those working in a factory complex and everyone in the surrounding districts. By correct planning, we can obtain all this and offer cost benefits to industry."

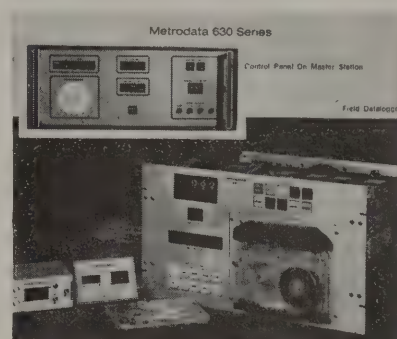
## 630 Digital Data Acquisition System

Metrodata Systems Inc. has introduced the 630 Series Digital Data Acquisition System to its growing line of monitoring equipment.

The 630 system is a complete monitoring system which acquires, stores, transmits and formats data obtained from sensors. The system is specifically designed for remote real-time

monitoring of instruments and sensors while they are operational at a distant field location.

Up to 40 input parameters, time of day, and station identification can be collected and recorded in a digital format suitable for immediate processing.



The 630 Series consists of any desired number of field data collection and formatting stations, referred to as the 630 Datalogger, and a central data scan, collection, and control master station, referred to as the 635 Central Data Controller.

Data couplers and standard voice-grade telephone lines link the field stations to the master station. The system requires only a standard commercial phone terminal at each site location.

The 630 Datalogger may be placed in various data reduction modes. The analog voltages generated by the sensors at the field locations are converted into a digital format and placed directly on a reel-to-reel  $\frac{1}{4}$  in. magnetic tape recorder/reader located at the field site.

Upon command from the Central Data Controller, the Datalogger will transmit the field station acquired data from the  $\frac{1}{4}$  in. magnetic tape to the master station via standard voice grade telephone lines.

As the data reaches the master station, it is edited, displayed on a CRT, and stored on a  $\frac{1}{2}$  in. computer-compatible tape recorder. The data may also be fed to a computer and a line printer for further analysis.

The field stations may operate independently of the master control station if so desired. Acquired data on magnetic tapes at the field sites may be mailed to the master station location where the data is translated and transferred to a  $\frac{1}{2}$  in. computer compatible tape. If a computer interface is used, the data can be transferred directly into the computer.

Metrodata Systems Inc. is a subsidiary of Weather Science Inc., Norman, Oklahoma, manufacturer of a complete line of data acquisition and data reduction systems for use in laboratory, aircraft, or unattended sites primarily for the collection of environmental data.

Other models include the 616 and 620 data acquisition systems, meteorological receivers for research radiosonde and rawinsonde soundings, and aircraft position recording equipment.

Reader Enquiry Service No. 7315

#### **C.E.G.B. Contract for Smoke and Dust Monitoring Equipment**

Wesglade Electrics Ltd, of Poynton, Cheshire, have been awarded a contract from the Central Electricity Generating Board, North Western Region, to equip nine power stations with 'Fordust' smoke and dust monitoring systems complete with recorders and air purging units.

Total value of the contract is approximately £73,000.

'Fordust' is a simple, easily installed system designed to give a continuous indication of smoke and dust levels in the ducts and chimneys of coal and oil fired furnaces. It can also be used in any application where a duct or chimney is used to emit smoke or dust into the atmosphere.

In addition to continuous monitoring duties, the 'Fordust' system will give audible or visual alarm when predetermined smoke or dust levels are reached.

Reader Enquiry Service No. 7316

#### **New Multi-Channel Gas Detection System**

The Model 1400, a new addition to their range of modular gas detection and alarm systems, has been announced by J. & S. Sieger Ltd., of Poole, Dorset.

The 1400 system consists of patented electro-catalytic sensors sited remotely in areas of potential flammable gas or vapour leakage, each connected to its own detection module positioned at a central control point.

The presence of gas at the sensor, in excess of a pre-set concentration at one or two levels, gives flashing alarm signals on the control unit and operation of external warning or control devices via relay contacts. This principle has been used successfully with the well established 1300 series but the new model incorporates significant additional facilities:

1. Each detection module is a self-contained unit with its own power supply, meter readout, test facilities and output signals. It can be supplied as a single wall or panel mounted unit or be incorporated into a tray housing either 1-3 or 1-7 modules. Thus exceptional flexibility is available in both installation and operation.

2. Special circuitry to the sensor enables distance between sensor and control module to be almost unlimited for all practical purposes.

3. Separate alarm and control relays are provided at each alarm level which enable either function to be operated individually or jointly as required and an alarm acknowledgement facility is also supplied as standard.

4. Use of test alarm facility automatically inhibits operation of alarm and control relays, enabling testing to be carried out without activation of any of the external functions.

5. Outputs for the operation of recording instruments are supplied.

6. Internal location of important controls prevent unauthorised operation of control relays.

The Model 1400 and associated sensors have been designed to conform to individual country safety requirements based upon I.E.C. recommendations and variations dictated by authorities in each country and Safety Certificates are pending.

Reader Enquiry Service No. 7317

#### **CS17A Industrial Grade Sound Level Meter**

The Department of Employment's 'Code of Practice for reducing the exposure of employed persons to Noise' has caused a big increase in the use of Sound Level Meters. Although, for many applications a simple Sound Level Indicator will perform the initial survey eventually the need for a more precise unit having more measurement capability shows itself. Castle Associates have just introduced a new unit for this purpose,

their CS17A. This unit, while being in the price range usually reserved for indicators is a General Purpose Sound Level Meter which fully complies with the appropriate British Standard, BS 3489.

Most similarly priced units claiming compliance are fairly rudimentary devices, but the CS17A has both 'A' and 'C' weighting with provision for the connection of recorders and oscilloscopes or even a noise dose-meter.

Castle Associates have also introduced a new calibrator for the CS17A. This is the PSQ 101 which is a miniature falling ball calibrator with a good low frequency spectrum. Together these units, which are available either in a complete kit or separately make up the most inexpensive general purpose noise measuring kit of its type.

The CS17A makes measurements from 24 dB to 140 dB using the same microphone type as is fitted to the most expensive British units and thus microphone accessories are interchangeable.

Reader Enquiry Service No. 7318

#### **Miniature SO<sub>2</sub> Sampler**

A new sampling instrument for atmospheric sulphur dioxide—battery-powered and weighing only 13 lb. (5.9 kg), but claimed to be as sensitive and accurate as most large, fixed sampling installations has been announced by C. F. Casella & Co. Ltd. Using sampling periods ranging from 1 minute to 24 hours, it can measure concentrations from 1,000 to 0.005 ppm (2,600 to 0.013 mg/m<sup>3</sup>).

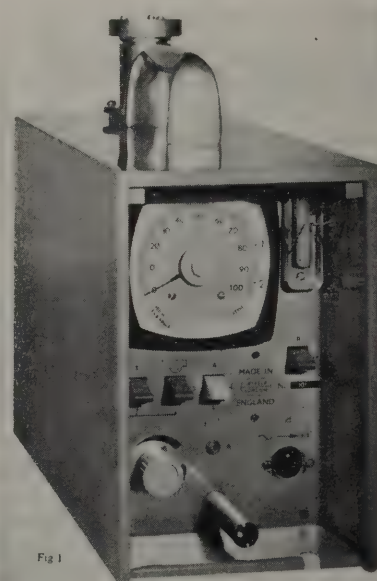
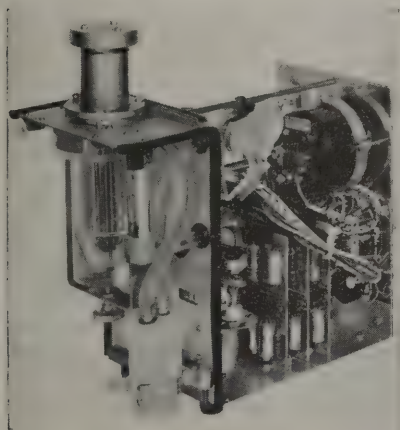


Fig 1

Being self-contained and readily portable, the instrument can be quickly set up at any desired sampling location, to assess occupational exposures within an industrial plant or air pollution levels outside. For concentrations above 1 ppm ( $2.6 \text{ mg/m}^3$ ), a useful reading can be obtained in a few minutes. Thus complaints from workers or the public can be tested quantitatively while the conditions causing them still exist. Likewise in a single morning, given stable weather, an investigator can take, for example, 20 separate readings at different locations round a refinery, a power station or a chemical works, and so plot 'contours' of pollution distribution.



The instrument's other main use is for accurate measurement of background  $\text{SO}_2$  levels at sites remote from mains power. Sampling periods between  $2\frac{1}{2}$  and 24 hours cover concentrations from 5 down to  $0.005 \text{ ppm}$  ( $13$  to  $0.013 \text{ mg/m}^3$ ). During sampling the instrument may be left unattended: the case being screwed to a tripod or chained to a post or tree, the controls being protected from the weather by tamper-proof front and rear panels. Dimensions of the case are  $11 \times 8 \times 5$  inches ( $28 \times 20 \times 12.5 \text{ cm}$ ).

A programmer/recorder is being developed to enable the sampler to take a series of readings automatically at preselected intervals—recording, for example, fluctuations in  $\text{SO}_2$  level over a working day.

Reader Enquiry Service No. 7319

#### Teesside, First Council to Install Philips Air Pollution Monitors

Teesside County Borough Council are the first council in Britain to install the Pye Unicam marketed Philips Sulphur Dioxide Monitors.

Teesside Public Health Inspectors' Department is to use this equipment,

coupled with meteorological instruments etc., to carry out a comprehensive study of the levels of atmospheric pollution in various parts of Teesside. Simultaneously, the Medical Officer of Health's Department is carrying out research into the possible effects of the general levels and diurnal variations of the pollution on the health of the community.

Three monitors have been purchased and are located strategically in the area under study. Unlike conventional  $\text{SO}_2$  monitoring techniques, which give average values of pollutions over a period of hours or days, the system provides a continuous measure of the level of  $\text{SO}_2$ . This allows short term, often very high, 'pollution pearls' to be identified which would otherwise be lost in a long term average.

The monitor is based upon a continuous titration of sampled  $\text{SO}_2$  with coulometrically released Bromine ions. This concept greatly simplifies maintenance and installation, as bulk storage and replenishment of reagent solution or gases are not required. The only supply service needed is electrical power.

A built-in calibrations source, provision for "zero" or "calibration" selection by either a plug-in timer or via a plug-in telemetry device giving the instrument a service interval of three months.

Multiple installations on the European continent and North America prove its worth both as a monitor and, coupled to appropriate meteorological equipment, pollution forecasting unit.

Reader Enquiry Service No. 7320

#### SLM 16A Sound Level Meter

The SLM 16A is a compact and low cost instrument for obtaining accurate, 'on the spot' measurement of sound level between 26 and 120 dBA.

Simple to operate, it has an easily read scale and incorporates a nine position switch and a slow and fast response facility.

The unit is fully transistorised and uses a universally obtainable battery giving long life. The instrument also includes battery check switching. Many applications will be found for the SLM 16A and range from use in the Building and Construction Industry to Motor Sporting events and Local Authority usage.

With the latest awareness of the dangers of health to excess noise, industry generally is accepting that a small and portable sound level measuring instrument is essential equipment.

Measuring  $177 \times 64 \times 69 \text{ mm}$  this item weighs only 0.6 kg. The U.K. price is £34.60 and delivery approximately three weeks. A carrying case and tripod are available as optional extras.

Reader Enquiry Service No. 7321

#### Los Angeles Approves and Uses, a Perkins Engine

A British made, Perkins diesel engine has been selected for use by the Bureau of Transportation of the City of Los Angeles, U.S.A., because it meets their noise and smoke emission regulations which are among the most stringent in the world.

Other factors influencing the choice include reliability, low operating and maintenance costs, durability and a competitive price.

The four cylinder Perkins 4-108 diesel engine is fitted as a side mounted auxiliary unit to 121 new refuse collection vehicles operated by the Bureau.

The Director of the Los Angeles Bureau of Transportation, Mr. Joe Purko said the Perkins diesel auxiliary engine met all specifications and had been thoroughly tested during a continuous two and a half year period.

He said the new refuse collection vehicles would provide marked benefits in terms of reduced noise and smoke emission levels and economic operation.

The Bureau's Equipment Superintendent, Mr. Donald Brittingham, said it was their first use of a Perkins diesel auxiliary engine and the results encouraged them to consider its further use.

"We found that its smaller physical size and lighter weight enabled the test vehicle to carry a larger payload. Maintenance during two and a half years' testing was minimal, merely the replacement of a water hose and minor radiator repairs.

"At the same time," he continued, "we found the Perkins diesel to be clean running, low on fuel consumption compared to gasoline engines doing the same work, easy to start in cold weather and relatively quiet."

Mr Brittingham added that most important was the fact that the Perkins engine met all of the United States emission standards including local, state and federal.

The engine had also exceeded specifications calling for a guarantee of one year's operation or two thousand hours.

The entire Perkins side mounted auxiliary engine package is so assembled that it can be removed easily and a new one inserted when repairs or service are necessary. This feature fitted into the Los Angeles Bureau of Transportation's component rebuilding programme designed to minimise downtime on equipment.

### **Breakthrough in Industrial Pollution Control Cuts Costs**

A new clean air system that can eliminate as much as 99.9 per cent of airborne particles in industrial exhaust gases, while using only 25 to 35 per cent of the power needed by conventional equipment, is now being introduced into Britain.

The makers, Purity International of Dublin, also claim that their system, marketed under the name Pentapure Impinger, is cheaper to install and maintain than existing equipment because of a patented application of established fluid-dynamic principles and the resulting simplicity of design and operation. In certain applications, the Purity International system can cost less than half the price of other equipment.

The system combines high efficiency dirt collection with great flexibility of application. It can handle airborne effluents, wet or dry, where conventional air cleaners are limited by moisture and temperature—eliminating particles down to 0.01 micron (one micron equals a millionth of a metre).

The smallest unit costs approximately £1,500 and copes with exhaust flows of between 500 and 3000 cubic ft. per minute. Larger units are available to handle the maximum industrial requirements and show a pro rata reduction in costs per cubic foot of gas flow treated.

"The thing that makes the system unique," says Dr. George Thodos, Professor of Chemical Engineering at Chicago's Northwestern University and a consultant to Purity, "is that it can equal or better other known dust removal systems, yet requires only a quarter to a third of the power".

The company claims that the equipment is easier to install than baghouses, simpler to maintain than high energy scrubbers, and does not have to be purpose-designed for each type of particle, as in the case of electrostatic precipitators.

Developed originally by the company's Chicago-based parent, the system is already working in a number of U.S. industries, including steel, foundries, chemicals, textiles, paper and fertilisers.

In Britain, Edward Curran Engineering Ltd., of Cardiff, have installed units in their enamel spray shops; a unit is currently under test at the Bedford foundry of George Fischer Castings Ltd.; and another has been ordered by the Glynwed Group for their Falkirk, Scotland, foundry.

Reader Enquiry Service No. 7322

### **Consine Designs Limited of Chesterfield—Exhaust Emission Dyno.**

Consine announce the introduction of their new exhaust emission dynamometer. This is specifically designed to enable motor manufacturers to achieve the more stringent 1975 emission requirements.

The very low emission levels require an extremely accurate dynamometer which is capable of applying repeatable loads to the car on test. The Consine machine is designed to satisfy these requirements and several unique features are incorporated.

Absorption is provided by a Thyristor controlled D.C. motor/generator with torque measurement by means of a strain gauge load cell on a torque arm. The dynamometer can be calibrated by using the D.C. absorber in its motoring mode so that problems associated with the calibration vehicle are obviated. No cooling water is required with consequent reduction in installation costs and complete freedom in siting. This type of absorber has the advantage of being easily linked to a computer or programmer and reduces operating costs because of power regeneration.

The rollers are 20in diameter for tyre safety and the flywheels are electro magnetically clutched. Inertia is varied remotely by simple dial switching.

A lift out platform is provided which also automatically positions patented vehicle retention bars to stop the car from leaving the rolls during high acceleration or braking rates.

The roll pairs are interconnected to eliminate errors due to the vehicle moving on to one or the other roller during high acceleration or deceleration rates.

As a modular addition which can be retro-fitted, the machine can be modified to give full high speed brake performance tests on individual wheels of both front and rear axles. A patented system of brake force measurement is used to make complete allowance for the basic inertia of the machine. This way it is possible to check the general efficiency and balance of all four brakes as well as an end of line emission test.

Reader Enquiry Service No. 7323

### **New Trianco (Mini) Econovent Self-contained Ventilation Heat Recovery Unit**

In response to demand from heating engineers throughout Europe, the new Commercial ECONOVENT unit is based on the long established industrial (ducted) heat recovery model, embodying all its proven design principles in one compact self-contained package for simple installation into existing or new buildings. It is suitable for use in offices, hotels, hospitals, schools, large domestic premises etc. where installation of individual units obviates ducting and provides localised environmental control.

Overcoming the problems of introducing adequate ventilation air into buildings without dust, noise and draughts etc. the new Trianco (Mini) ECONOVENT unit will improve the inside environment by not only filtering incoming fresh air but economically warming it by the recovery of latent and sensible heat (or cool) from the outgoing stale air. The efficiency of the heat (cool) exchange can be in excess of 70 per cent overall.

Stale inside room air is drawn by a fan into the base of the unit, through a filter, and expelled via the rotating heat recovery wheel to the outside atmosphere. The wheel matrix becomes warmed (or cooled) by the passage of this air. Filtered fresh outside air is simultaneously drawn by a second fan through the warm (or cool) rotating wheel where it becomes warmed (or cooled). It is then directed via a top plenum chamber into the room to replace the exhausted stale air.

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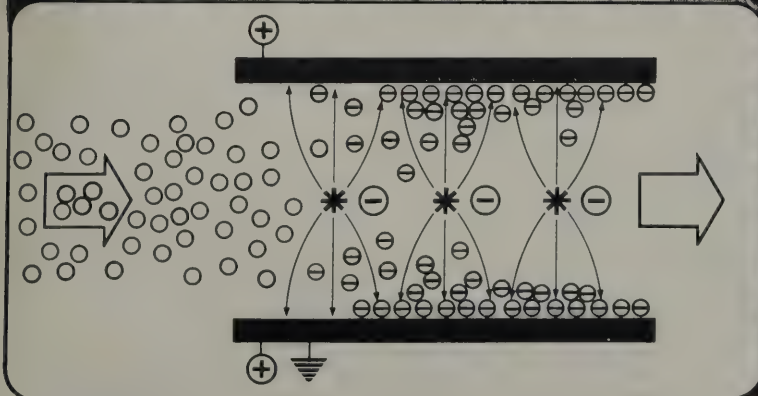
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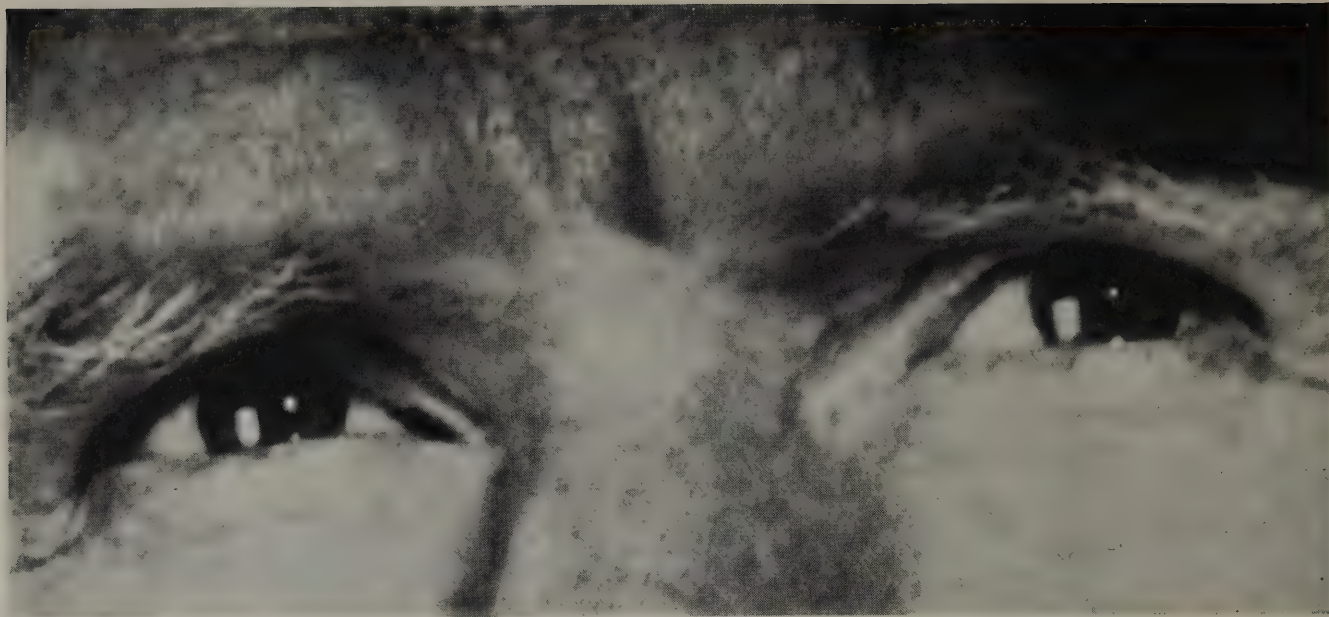
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**SUMMER 1973**

**VOL. 3 NO. 10**

## **PRINCIPAL CONTENTS**

**Estimates of Air Pollution in the  
United Kingdom in the Year 1971-72**

**Sixteen Years—A saga of Smoke  
Control, G. O. Allen**

**Scrap and the Environment,  
M. F. Tunnicliffe**

**The Secondary Metals Industry and  
the Environment, E. C. Mantle**

**News From The Divisions**

**Book Reviews**

**Industrial News**

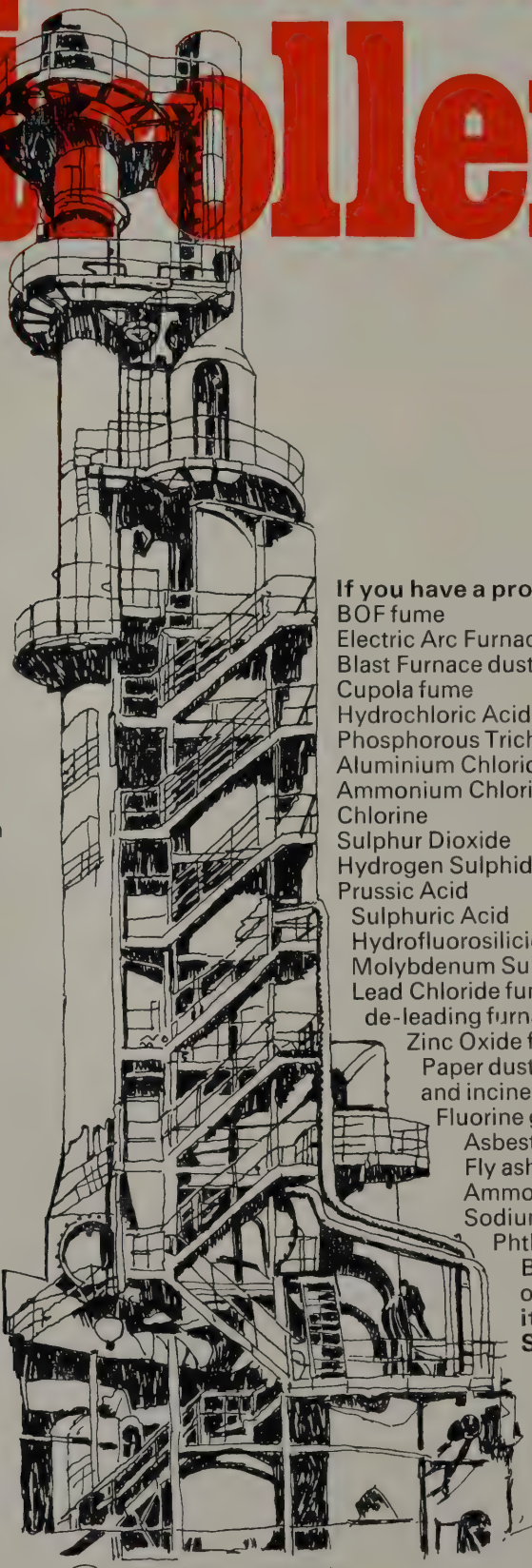
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# CLEAN AIR

## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

Vol. 3 No. 10

Summer 1973

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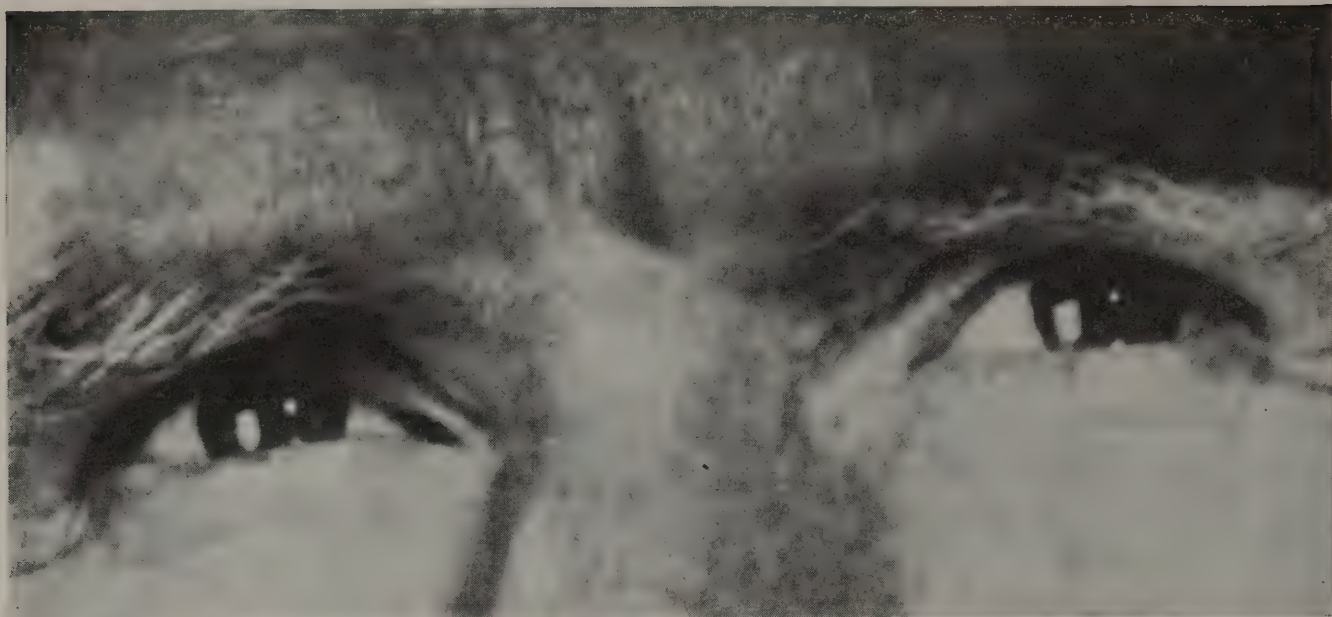
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# CLEAN AIR

## The Arnold Marsh Clean Air Awards

Sometime ago the Council of the Society decided that they would like to make Clean Air Awards to individuals and organisations that had rendered outstanding service to the cause of clean air. These Awards would be made in three classes: to individuals, to local authorities and to industry. To commemorate the services of the late Mr. Arnold Marsh as Director of the Society, a position which he held for some 40 years, it was agreed that the Awards should be designated the "Arnold Marsh Clean Air Awards."

Accordingly a Select Committee was appointed to consider the nominations and applications for the Awards. The Committee had to consider the merits of some 15 individuals, 10 local authorities and 13 industries. This was by no means an easy task but the Committee have now made their selections and the Council of the Society have approved their recommendations that individual awards should be made to Dr. Gordon Nonhebel and Dr. Albert Parker; that local authority awards should be made to the Corporation of London, the City of Salford and the City of Sheffield, and that industrial awards should be made to British Petroleum Company Limited (Technical Services Branch) and the Central Electricity Generating Board.

Dr. Albert Parker who was awarded the C.B.E. in 1946, is a chemical engineering consultant who is well known to members of the Society. He was President of the Society from 1963 until 1965 and was for many years Chairman of the Society's Technical Committee. Dr. Parker has been a Research Fellow of Manchester University, a lecturer at Birmingham University, the officer in charge of research and full scale development work for the Institution of Gas Engineers and Leeds University, the Director of Water Pollution Research and the Director of Fuel Research and Air Pollution Research in the former government department of Scientific and Industrial Research. His active interest in the mitigation of air pollution and water pollution began in the 1920s and has continued ever since. He was an assessor to the Beaver Committee whose reports in 1953 and 1954 led to the 1956 Clean Air Act.

Dr. Gordon Nonhebel, who is a consultant chemical engineer and fuel technologist, was formerly with I.C.I. He has had a long interest in clean air and was a member of the Beaver Committee in 1953 and 1954. He has been a member of the Clean Air Council for England and Wales since 1962 and was for many years a member of the Executive Council of the Society.

The City and Port of London was the first local authority to declare the whole area as a designated smoke control area: this was in 1954. History shows that the City of London has been involved with and concerned about pollution problems for centuries, and has now achieved an outstanding success in clean air measures not only in the square mile of the City itself but also over 70 miles of waterway in the Thames Estuary.

The City of Salford which has a population of some 160,000, has been active in pollution control since 1862 when an Act was passed to control the emissions of black smoke. In this century a private Act for controlling smoke was passed in 1948 and three smokeless zones were declared in 1950. Since 1960, 23 further smoke control orders have been brought into operation so that now the whole of the City of Salford is subject to smoke control. Smoke readings have revealed a drop from 588  $\mu$ /gm per cubic metre in 1948 to 195  $\mu$ /gm per cubic metre in 1971; similarly sulphur dioxide readings have dropped from 437  $\mu$ /gm per cubic metre to 163  $\mu$ /gm per cubic metre in a similar period.

The City of Sheffield, with a population of some half a million spread over 71 square miles, is the traditional major steel industrial town which for long has used coal as its fuel. It has had major problems with the steel smelting industry and the use of oxygen. In the last century the first control bye-law was introduced in 1852 and as long ago as 1890 the City appointed a specialised staff to exercise control over air pollution. Since 1957 smoke control orders have been progressively introduced and the whole of Sheffield became subject to smoke control by the end of 1972. As a result of the action which has been taken, smoke concentrations have been reduced from 350 to 60  $\mu$ /gm per cubic metre and those of sulphur dioxide from 280 to 160  $\mu$ /gm per cubic metre.

*Dr. Albert Parker**Dr. Gordon Nonhebel*

The Technical Services Branch of British Petroleum Limited have received their award for their important contribution to industrial chimney design since the growth in the use of oil fuel from 1950 onwards and the concurrent smut and corrosion problems. The research work carried out by B.P. in the use of aluminium clad flues has been an important contribution to the fact that 10,000 of these chimneys are now in successful operation in the U.K. and they make a great contribution to cleaner air. The use of such chimneys has also resulted in a 10% nett saving of fuel usage with a similar reduction in emissions in sulphur dioxide and the oxides of nitrogen per ton of steam raised.

The Central Electricity Generating Board have over a period of more than 15 years gradually and progressively improved methods of solid and liquid fuel combustion which has resulted in reduced emissions and better dispersion of effluent by fewer but higher chimneys. During this time much basic research on power station development has been carried out and emphasis has been placed on cleaner air and improved instrumentation for measurement of emissions and monitoring.

The Awards, which will take the form of suitably inscribed medallions, will be presented to the recipients by Mrs. Arnold Marsh at a special meeting following the Society's Annual General Meeting at the Connaught Rooms, London on the morning of Tuesday, 26th June 1973.

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## **Mr. J. W. Batey Appointed to Advise John H. Haiste & Partners on Air Pollution Control**

Mr. Joseph W. Batey, an author of several works on environmental control and a member of a wide range of advisory bodies, has been appointed to advise John H. Haiste & Partners, the Leeds based civil and structural engineers, on matters relating to air pollution control.

In 1954, Mr. Batey succeeded Mr. James Law as Superintendent Smoke Inspector to Sheffield City Council. He is an examiner for the Royal Society of Health Diploma in Air Pollution Control and for the City and Guilds Boiler Operators Certificate, and also acts as an

examiner for the Sheffield Trades Technical Society. A member of the Fuel Advisory Committee of Sheffield University and also a member of the University Council, Mr. Batey was recently elected the first (and only) honorary member of the Yorkshire Council of the Environment. He was chairman of the Yorkshire Divisional Council of the National Society for Clean Air.

Mr. Batey was a member of the working party set up by the Minister to consider standards for the emission of grit and dust from chimneys, and has acted for the Association of Municipal Corporations on various technical committees.

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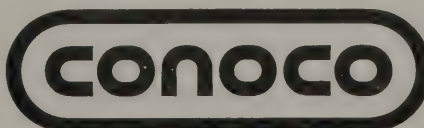
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## Estimates of Air Pollution in the United Kingdom in the Year 1971-72

Table 1

**Estimates of Pollution by Smoke and Oxides of Sulphur in Million Metric Tonnes  
from the Main Uses of Primary Forms of Energy**  
*(one metric tonne=0.9842 long ton)*

**Estimates prepared by Albert Parker, CBE, DSc.**

*Figures for quantities of forms of energy were derived from the Digest of United Kingdom Energy Statistics issued in 1972 by the Department of Trade and Industry.*

<i>Form of Energy and Class of Consumer</i>	<i>Quantity of Energy</i>	<i>Quantity of Pollutant</i>
<b>Smoke</b>		
<b>Coal</b>		
Domestic, including miners' coal .. .. .	15.2	0.47
Railways .. .. .	0.1	small
Industrial and miscellaneous including collieries .. .. .	17.2	0.05
	<hr/> 32.5	<hr/> 0.52
<b>Sulphur oxides</b>		
<b>Coal</b>		
Domestic, including miner's coal .. .. .	15.2	0.29
Electricity power stations .. .. .	68.9	1.99
Railways .. .. .	0.1	small
Collieries .. .. .	1.3	0.03
Industrial and miscellaneous .. .. .	17.2	0.42
Coke ovens .. .. .	20.5	0.09
Gas supply industry for gas making .. .. .	1.1	0.01
Low temperature carbonization plants .. .. .	2.5	0.01
Patent fuel plants .. .. .	1.4	small
	<hr/> 128.2	<hr/> 2.84
<b>Coke (excluding consumption in gas works and blast furnaces)</b>		
Domestic, including other manufactured solid smokeless fuels .. .. .	5.1	0.08
Industrial and miscellaneous .. .. .	3.0	0.05
	<hr/> 8.1	<hr/> 0.13
<b>Oil</b>		
Domestic .. .. .	3.0	0.02
Industrial and commercial .. .. .	53.4	2.31
Gas supply industry .. .. .	1.9	small
Road transport .. .. .	20.1	0.05
Railways .. .. .	1.1	0.02
Marine craft (inland) .. .. .	1.4	0.04
	<hr/> 80.9	<hr/> 2.44
Sulphur oxides overall total .. .. .		<hr/> 5.93
Hydro-electricity (coal equivalent) .. .. .	1.8	
Nuclear-electricity (coal equivalent) .. .. .	9.8	
Natural gas (coal equivalent) .. .. .	26.2	
Total coal equivalent, including oil at 1 tonne=1.7 tonnes of coal and including petroleum gases .. .. .	328.5	

The amount of 53.4 million tonnes of oil used in 1971-72 for industrial and commercial purposes is equivalent in heating value to about 90.8 million tonnes of coal, which if used for the same purposes would have produced about 0.27 million tonnes of smoke and about 2.3 million tonnes of oxides of sulphur. The overall total amount of 5.93 million tonnes of oxides of sulphur is 1.805 per cent of the total coal equivalent of 328.5 million tonnes.

Of the 53.4 million tonnes of oil 15.1 million tonnes was used for electricity generation.

Table 2

**Estimates of Pollutants from Road Vehicles in the United Kingdom in the Year 1971-72 in Million Tonnes**

Consumption of Motor Spirit 14.96 million tonnes  
Consumption of Derv Fuel 5.19 million tonnes

<i>Pollutant</i>											<i>Petrol Engines</i>	<i>Diesel Engines</i>
Carbon monoxide .. .. .	..	..	..	..	..	..	..	..	..	..	7.0	0.11
Hydrocarbons .. .. .	..	..	..	..	..	..	..	..	..	..	0.36	0.022
Aldehydes .. .. .	..	..	..	..	..	..	..	..	..	..	0.01	0.003
Oxides of nitrogen .. .. .	..	..	..	..	..	..	..	..	..	..	0.24	0.08
Oxides of sulphur .. .. .	..	..	..	..	..	..	..	..	..	..	0.015	0.03

The estimated quantity of carbon monoxide discharged into the air from the other industrial and domestic uses of all fuels in the year 1971-72 is about 9 million tonnes including about 3.5 million tonnes from domestic heating appliances. These discharges are above ground level whereas the discharges from road vehicles are at ground level.

#### Lead

The total amount of lead in the lead alkyl compounds added to the 14.96 million tonnes of motor spirit used in the United Kingdom in 1971-72 was about 10,800 tonnes. The lead would be converted to complex inorganic compounds and about one-third would be retained partly in the lubricating oil and partly in the exhaust system. This means that the amount of lead in the compounds discharged in the exhaust gases from petrol driven vehicles in 1971-72 was about 7,000 tonnes.

## Minister Sees M6 Motorway Traffic Noise Experiment Substantial Reductions in Noise Levels Achieved

Mr. Keith Speed, Parliamentary Under-Secretary of State, Department of the Environment, has recently visited Birmingham to see the progress that has so far been made in experiments to reduce the effects of traffic noise from the M6 motorway.

At a flat in Douglas House, Firs Estate, Castle Bromwich loaned to the Department by the Birmingham City Housing Department experiments are being conducted in noise insulation. Modifications to the flat carried out by the Building Research Establishment consist of double glazing all the windows and providing sound-insulated ventilating units. The insulation reduces the level of the intruding traffic noise to less than a quarter of the level with normal single glazing with all the windows closed. The installation also has the advantage of providing full ventilation.

Other experiments are being carried out with noise barriers by the side of the motorway at Perry Barr. By the middle of May, a barrier on the North side of the M6 motorway was completed. Its full height of 3 metres above the carriageway includes a length of barrier on

the parapet of Queslett Road bridge. At the same time, a barrier on the south side of the motorway, including the bridge length, was completed to a height of 2 metres which will subsequently be raised to 3 metres. Noise readings are being taken by the Transport and Road Research Laboratory at various stages of construction of the barriers. Depending on weather conditions a preliminary analysis of all noise readings should be available by the end of July.

Preliminary checks of the north side barrier show that a noise reduction of 6-10 dB(A) can be expected in situations where the noise level originally exceeded 65 dB(A). This is in line with the Building Research Establishment predictions.

Investigations carried out at two more houses in Great Barr, Birmingham where it was thought that vibration from motorway traffic was causing damage to the plaster showed that in the relevant parts of the houses, vibrations due to motorway traffic were less than those caused by normal domestic activities.

# SIXTEEN YEARS

## A saga of Smoke Control

by

**G. O. Allen, F.A.P.H.I., M.Inst. P.C., Chief Public Health  
Inspector and Environmental Health Officer to the  
Borough of Scunthorpe.**

Two children born and bred in a modern town, visited relations in the country for the first time. They were amazed to see their grandfather place some black stones onto a fireplace and coax out of them some flame, smoke and a bit of warmth. When enquiring what he had done, his reply was "That is coal, that I've put on the fire."

Far fetched? Probably, but the last sixteen years has seen tremendous changes in the production of heat and the next sixteen years can see more. Are we therefore at the half way stage. Will it be another sixteen years before we are completely smokeless? What will be the cost of conversions at that time?

In the past sixteen years, the average cost of a conversion has risen astronomically. At one time, the gas boards were giving free installations, free gas points and so on. We were encouraged to burn hard coke. We complained bitterly in those days that we were burning hard coke at a price when only a decade before the gas works were glad to get rid of it at one shilling a bag. We were allowed to have electric fires, then suddenly for a while, these were forbidden. Oil fires? sorry not in the early days. Open insets replaced stool bottom grates, there were conversion kits to put open inset fires into certain combination ranges. We had gas poker points, and later came electric pokers.

We enthusiastically planned our town to be smoke free in ten years, we cajoled the laggards, we shuddered at the black areas. We swept into the sixties with fervour. Our banners were high, we proudly marched on singing "Keep the home fires burning, smokelessly." What happened? Let us recall the words in the Bible. "Behold a sower went forth to sow; and when he sowed, some seeds fell by the wayside, and the fowles came and devoured them up; Some fell upon stony places, where they had not much earth; and forthwith they sprung up, because they had no deepness of earth; And when the sun was up, they were scorched; and because they had no root, they withered away. And some fell among thorns, and the thorns sprung up and choked them; But others fell into good ground and brought forth fruit, some a hundredfold some sixtyfold, some thirtyfold.

Some of the stony ground could have been cultivated, but the nature went out of the soil with shortage of solid fuel, with strikes that affected the nationalised industries, and with the sudden realisation that it was not cheap any more to have smoke control areas. Like everything else the costs were rising. Superior appliances were replacing the 1960 old fashioned types. The public

wanted comfort, and they and the local authority paid for it. My old Chairman always said "There's no price on health". He also said "My mother lived to be ninety and the air did not affect her".

Everybody suggested that bronchitis was caused by atmospheric pollution, but no one had the courage to put onto a bag of coal, the warning words now on a cigarette packet. "Warning by H.M. Government, Smoking can damage your Health".

We looked ahead and found that many householders would like to put in modern appliances, but, they were not in approved smoke control areas.

We probed the Government "Can we help these people who want to help us clean the air?" "No" was the reply. "Even if they did convert you could not force them to burn smokeless fuel unless they were in a smoke control area."

I never could find out how a gas or electric fire could belch out the smoke that the Civil Servants expected.

I would wager that if householders had been allowed to convert to appliances approved by the local authorities, irrespective of whether they were in a smoke control area or not, that the work would have snowballed. The very efficient gas and electricity boards would have seen to that. The Coal Board would have had their smoke consuming fires much sooner, and more Local Authorities would now be sitting back with the well known saying, "Well done, thou good and faithful servant."

These random thoughts of mine appear to come from a person who appears to be suffering from a liverish complaint. This is not so. They come from a person who is concerned about costs as well as health. We all know the Yorkshire saying "Where there's muck, there's money." I recall the days when a chimney smoking meant a full stomach. I hope that I have progressed and improved my ideas since then. I want clean air. I want it taxed. Otherwise, I want the costs to be borne by the householder and the Government, and I want the local authority out of its role as middleman/financier.

Before I can give my thoughts on the next 16 years, lets look at the history of the past years. I have two history books. One consists of all our own pamphlets issued in each smoke control area, the other contains all the legislation issued from "somewhere" in the southern area of England.

As legislation replaced legislation, so our own pamphlets were amended.

Do you recall the Beaver Report issued in 1954, before our sixteen years started? I quote "The object of our recommendations is that by the end of 10 to 15 years, the total smoke in all heavily polluted areas would be reduced by something in the order of 80%. This would mean a degree of freedom which many parts of the country have not known for more than a century." A remarkable prophesy.

I have read and re-read this report and I am amazed at the accuracy of thought and the planning for the future.

With the 1956 Clean Air Act, came the Memorandum on Smoke Control Areas. Our guide to the future. Our mathematical brains were introduced to 7/10ths, 3/10ths etc. We even had to keep 7/20ths in mind for two years for fear a tenant moved away with moveable gas or electric appliances they had helped to pay for.

I wonder how many officers have returned to the areas established in the early days and tried to find out how many householders have coped with the fuels that were a long time coming. The owners of property co-operated by providing open insets in lieu of stool bottom grates. Now the open insets are obsolete and many parts are irreplaceable. Appliances superseded appliances without a thought for the future.

Has anyone ever thought of the possibility of re-designating their Smoke Control Area No. 1, to allow these obsolete appliances to be replaced? Go to the Government! What would be the very Civil Servant's reply? "These people have already had grant aid and you can not pay grant twice."

Has anyone gone back to the old age pensioners who tried to burn coke, then the more activated fuels, and who now try to keep warm throughout the day by other means, so that they can have some cheer at night?

Many local authorities are completing their smoke control programmes. Shall they start again?

The years 1959 and 1960 appear to have been the preparatory years. Many questions must have been put to the Government, because in 1960, we became familiar with the model questions and answers. It seems remarkable that this was not made an official publication. If the Ministry had tackled this problem in the same way as another Ministry tackled the Offices, Shops and Railway Premises Act, I am sure that the surfeit of paper could have been a great help.

The solution of educating the public was once again put as a cost on the local authority. I have seen many publications for the guidance of the householder, but I can only speak personally of ours in Scunthorpe.

The first book was really educational. The outer cover was red and green. Red for the glow of the steel furnaces reflected in the sky at night, green for the green fields of Lincolnshire. Our motto "REFULGIT LABORES NOSTROS COELUM" was literally translated as "The sky will reflect our labours, only when the air is clear."

The book contained many sayings such as: -

- 1 Too many cooks spoil the broth.  
Too much smoke spoils the breath.
- 2 Men make houses, women make homes.  
Smokeless fuels help women to make homes.
- 3 There is no smoke without fire, but, you can have fire without smoke.

There did appear guidances on how to get a grant, what to do. What not to do.

There was even a page entitled "What industry is doing."

I thought of a word "SMOGOG". A Smogog is a person who believes in atmospheric pollution, who likes polluted air, wants unhealthy conditions and who looks on the black side of life.

When we issued these books we sat back and thought to ourselves that it would be plain sailing. We over estimated our own intelligence. There was so much reading in the sixteen pages that nobody understood it. My ego collapsed, my thoughts of a massive income from the huge sale of our pamphlets as an educational booklet, were sadly bruised.

I decided, if the public could not read, I would tackle those that could see. The next and subsequent efforts were termed our "Enid Blyton" pamphlets. I relied on pictures instead of words. Pictures that showed before and after conversion.

These pamphlets are revised with each area.

I do feel that in the last ten years the public have become more educated to clean air and smoke control areas. The national advertising and the enthusiasm of all the nationalised boards have really helped local authorities, and it is only a few who still require to see pictures and to be convinced that conversion is not a religious pastime.

In 1962, the Government decided that they wanted a simplified application form for approval of smoke control areas. One sensed that realism was now becoming apparent in higher circles. The memoranda explaining the memoranda became more explicit.

In 1963, the gas cokes were becoming sophisticated. The cokes were christened and given names like Gloco and Seprite. They even had a British Standard Specification (No. BS 3142). This was in April. Alas, in December of the same year, came a phrase which I have spoken time and time again "Owing to technological changes in the gas industry."

It simply meant that "open grate gas coke could no longer be regarded as the main replacement for raw coal in future smoke control areas."

Were the Gas Board looking to the North Sea? Production of gas coke was declining. The electricity boards were experiencing difficulty at peak load periods and it was now put on to give a grant on an electric fire. We could have storage heaters, but we were gradually being weaned away from our focal point for evening, a red glowing fire, whether it be real or artificial.

We still plodded on, convincing people that they should spend more money to put in better appliances.

In the same December circular, our friend the open inset was suspect. If supplies of open grate fuel were not available no grant for the cheapest kind of appliance.

The cost of appliances was rising so much that we had credit facilities for purchase and installation of heating and cooking appliances.

Some of us had difficulty in interpreting what classes and standards of work were reasonably necessary. We were given as a rough guide that the national cost of adaptation could be taken as £25 for each room in which appliances in regular use would have required works of adaptation attracting grant.

Regular use. How I worried about this. If the front parlour was regularly used on Saturday nights, I felt it warranted conversion. I was not so sure about Christmas and holidays, but I conceded that if he and she had a row, and were not speaking for a time, he or she had a right to sulk in front of a separate fire. I had to accept that if the fireplace was papered over, it was not used, whilst if there was evidence of soot in the chimney, it could be in regular use.

It was another year, in December 1964, before direct acting electric space heaters became officially banned.

The most important circular took 9 years to appear. No. 51/65 which dealt with grant arrangements. Previously we had had to worry our way by checking circulars, ringing the Ministry or sending out circulars to other local authorities asking "What are you paying as a grant and how do you manage it."

It was another 3 years before the figures were revised, and a further 3 years for the second revision. These figures are of course costs of conversions and not fittings. With the rise in wages that has gone on throughout these years, I feel that the word I used at the beginning of my paper "astronomical" is suitable to describe rise in prices.

I have managed to keep details of the costs of fuels over the past ten years.

In 1962, 1 ton of coal cost £12. 8s. 4d.; the same type of coal now costs £19.21.

The special smokeless fuels in 1962 varied from £11 to £14; present day prices are at £25 to £26.

At short notice, I could not get the costs of gas and electricity to compare, but I would surmise that the increase is in the same proportion.

I am not trying to criticize the solid fuel industry, but if we never had had coal, there would never have been the pollution that we have experienced. Shall we ever come across a planet that is populated by some form of humanity that has never experienced the warmth and comfort of the open fire?

I am sure that our past, present and future senior citizens would have welcomed a pollution revolution to have taken place with our industrial revolution.

A look at some of the appliance costs also shows the same upsurge in costs. Open inset fires have risen from £4 to £10. Gas room heaters from £11 to £30. Electric fires from £11 to £20. Solid fuel cookers show an increase from £50 to £125, whilst gas and electric cookers have a more modest rise from £35 to £50.

As I looked at the costs and also the allowances for the different appliances over the past sixteen years, I thought how crude we were, and how many of us use householders as guinea pigs, with the blessing, of course, of the Government.

I have spoken of the different memoranda giving grant arrangements. These are documents that I look forward to. Everything is out of date within such a short time that it is necessary for prices to be amended more regularly, than at present.

I have just checked the 1971 grants with present day prices, and I find that whilst some are still satisfactory, others are not. When the grant figures are tight, many owners have to put in the cheapest appliances. They need not, of course, but some do. We all know that the cheapest appliance is not always the best, so I ask that consideration should be given to realistic revision of grants.

I feel certain that very few authorities give similar grants and I wonder how many houses still contain the original type of appliances.

The question of grants have concerned me for many years. I did advocate a block grant system similar to the improvement grant. Some people supported me but the seeds I tried to sow fell by the way side.

I wonder, therefore, now we are in the Common Market if I can twist "metrication" by asking for the grant I recommend to be paid be the actual amount and not have to be divided by 10 and multiplied by 7.

For instance, the present grant on a room heater is £32, which means that the householder gets £22.4. The cost of a cheap gas fire at the present time which could qualify for full grant is £32.

How strange it would seem to be able to give straight forward figures of say £20 instead of £20.24. It would save money and errors of the infallible computers.

The popularity of each type of heat waxes and wanes according to the whim of the population. As I am preparing the draft of this paper, I read of a Medical Officer, who is extolling the virtue of the open fire as an inducement to a satisfied sex life and it is stated that there could be less divorces in a house where the couple can contentedly indulge in whatever takes their fancy.

The facts that worry me are the uncertainty of constant heat by any of the recognised forms of heat.

A miners' strike means no coal, no special fuel and no open fire.

A strike at the power station and we have no electric fires and energy for the pumps that work solid fuel or gas central heating systems.

Gas did appear to be the old faithful, but go-slows now occur and gas in suspect.

We were guaranteed an ample supply of gas from the North Sea. Somewhere I thought that I had read that it was to be a cheaper fuel than the conventional gas we had known in the past. We can only hope that the supply is unlimited. Gas, however, must come under the class of uncertainty by reason of the safety factor. Here again we read of "the accident was probably caused by a fractured gas main" or "the old person had no sense of smell and did not realise that the gas was on."

In 1973, we must ask the question "What are the back room boys coming up with for the future?"

Will we ever be able to store heat for long periods?

The next sixteen years must see some efforts made to provide a constant supply of heat at a reasonable price. Old people must not die from hypothermia caused by the fact that they could not afford to buy fuel and they were too proud to seek "charity".

I do feel that the latter sentence concerning the word charity or fear of begging from Social Security will disappear.

In my lifetime, the word "workhouse" has gone, soup kitchens are a thing of the past. There must be a substantial and continual rise in the pensions to counter rises in cost of living. The pension must be adequate to provide for just a bit more than a modicum of warmth.

During the past sixteen years we have seen many new houses built, many old ones demolished, and the present trend is for many to be improved.

I was pleased with the building regulation that allowed for the putting in of smokeless appliances in new properties.

It seemed strange that we could not insist that they burnt only smokeless fuels. Notwithstanding the fact that in a number of instances the fuel burnt was unsuitable and detrimental to the appliances.

Is it not practical that clean air and improvements should go side by side? I know some officers practice this, but I have a feeling that it is the few rather than the many.

In many improvement areas, we have the owners who are not prepared to improve their houses voluntarily. The setting up of a smoke control area with the powers of compulsion would, no doubt, cause an owner to think that if part improvements had to be done, why not all.

I asked our Senior Control Assistant if she had any observations to give me. I felt that the person nearest to the householder should know something.

I give you her comments:—

"Although one feels, at times, that there must be a simpler method of allocating conversion grants, it is very difficult to envisage a system which could be acclaimed as fool proof.

"The present system of allocation, whilst still not 100% perfect, is the result of twelve years practical endeavour by various people connected with the Smoke Control

office. Snags have been ironed out as, and when, encountered and provided that conscientious and judicious effort is maintained, the present system seems quite adequate.

"I have found that the greatest cause of dissatisfaction has been the utterly unfair policy of ignoring the "good citizens" who have voluntarily converted to smokeless appliances before being enforced to do so. Although, it is my lot to justify to these people, the official governing policy in this matter, I feel it is regrettable that there seems to be no reward for personal endeavour.

"In the case of pensioners and cases of hardship, one is aware that they are governed by finance (or rather, the lack of it) and they are unable to make changes until conversions are made compulsory.

"There are, however, one feels, quite a number of householders with adequate means who are becoming aware of the sizeable grants now available in connection with Smoke Control Orders, and who are quite satisfied to contaminate the air with smoky appliances, claiming that they love to see "a bit of flame" from an open fire. It is amazing to see how quickly this desire diminishes when they realise that to retain "a bit of flame" means that they receive the minimum grant allowance (i.e. open inset fires): suddenly their tastes become far more sophisticated and more expensive."

I recall the old saying "Out of the mouths of babes and sucklings come forth words of wisdom."

Our Smoke Control Assistant is neither a babe nor a suckling, but I feel that all will agree the words she has written have a touch of wisdom about them.

This last paragraph is being penned on 22nd December, near to Christmas, so I would like to conclude by hoping that some Civil Servant or Minister will become a good fairy (with wings) and grant me the usual wishes:

- 1 Freedom to approve grants outside smoke control areas.
- 2 A fixed amount of grant for different types of appliances to be amended as the prices inevitably rise.
- 3 Improvement areas to be automatically declared smoke control areas.
- 4 Smoke control not to be subsidised by local rates.
- 5 My last wish would like to see the National Society for Clean Air become a friendly society, simply because the air was clear, everybody had co-operated, everybody was warm, everybody was happy and there was no more work to be done.

REFULGIT LABORES NOSTROS COELUM.

# TEESSIDE MIST

## Summarised Report of the Working Group of the Interdepartmental Committee on Air Pollution Research

In 1967 the Interdepartmental Committee on Air Pollution Research (ICAPR) set up a Working Group on Teesside Mist to examine the incidence of mist in the Teesside area and its relation to meteorological factors and emissions of pollutants. The Working Group asked the Atomic Energy Research Establishment, Harwell (A.E.R.E.) to investigate the problem and report back. A preliminary investigation was started in 1967 and a full scale investigation, using detailed chemical sampling and automatic monitoring of meteorological parameters at a number of sites in the Teesside area, was undertaken during 1970.

The Terms of Reference were: "To examine the existing state of knowledge regarding the phenomena of 'Teesside mists', with a view to assessing the extent and seriousness of the nuisance; to identify the further researches necessary to elucidate the composition of the mists and mechanism of their formation and thence determine how to abate the nuisance; to make recommendations to the Interdepartmental Committee on Air Pollution Research as to which organisation(s) could most suitably carry out the necessary research; to report from time to time to the Interdepartmental Committee on progress made."

Visibility in the Teesside area, as on much of the N.E. coast of Britain, has often been reduced, particularly in spring and summer, by sea mists formed in easterly and north-easterly winds, when the sea is cold enough to cool the air below the temperature at which moisture condenses in the air mass. When there is no air pollution, the droplets of pure water formed soon evaporate under the influence of the sun's heat as the air passes overland, and therefore the mist extends only a short distance from the coast. However, when water-soluble particulate pollutants are present in the droplets, they no longer evaporate completely as the air temperature rises, so that the mist persists for a longer distance inland.

During 1970, during the weeks beginning 10 May, 7 June and 2 August, there were periods of particularly poor visibility on Teesside, as elsewhere on the N.E. coast, associated with sea mist conditions. For much of this time conditions were made worse on Teesside by the presence of large concentrations of soluble particulate pollutant material in the mist. The major constituent of this material was ammonium sulphate. Visibility at Stockton and Teesside Airport was at times as low as 100 metres, though 500 to 1,000 metres was more typical.

Little of the ammonium sulphate was originally emitted as such, but was mostly formed in the atmosphere as a result of chemical reaction between sulphur dioxide and ammonia in the presence of water. The sulphur dioxide arise from the combustion of sulphur-containing coal and oil for industrial and power production purposes on Teesside. The contribution from domestic sources was small during the summer period

when the mists are most common. High concentrations of ammonia on Teesside derived largely from emissions from ammonia-manufacturing plants at the ICI site at Billingham, though there was a small contribution from other sources, typical of all populated areas. In order to form ammonium sulphate it is necessary first for the sulphur dioxide to become oxidised to sulphuric acid. Normally this process takes place only slowly in the atmosphere, but under the conditions of a mist, where there is a large number of water droplets present, the oxidation rate is much increased: it is suspected, though not yet proven, that the presence of high concentrations of ammonia also enhances the oxidation rate.

On some occasions during the weeks mentioned, the meteorological conditions were particularly conducive to the formation of high concentrations of all types of air pollutant emitted in the Teesside area. During certain nights there was sufficient cooling of the land surface relative to the sea for the formation of a "land breeze", when the normal north-westerly on-shore wind was reversed in direction in a shallow layer near the ground. Pollutants emitted during this period were trapped under a strong but low inversion (300 ft above ground) and blown seawards. On the following morning, when the sun's heat became sufficient to break down the "land breeze", the north-easterly wind was restored and the pollutants, still trapped under the inversion, were blown back again over the Teesside area to be joined by fresh emissions. Such conditions were particularly conducive to the formation of ammonium sulphate and the highest levels (maximum 1,280 microgrammes/cubic metre at Stockton) were observed under such conditions. The episodes were referred to locally as "typical Teesside mist".

Although, in this investigation, most attention has been directed to the special episodes of Teesside mist, it must be stressed that these occur only infrequently and that their incidence was lower in both 1969 and 1971. Their occurrence, often during daytime, in the summer period, when mist and fog is absent elsewhere, does, however, make them more noticeable to the general public. Also it must be stated that although very high levels of ammonium sulphate were observed during the incidents, the average level taken over the whole of the summer period was no higher than would be expected elsewhere, taking into account the density of population and industry in the neighbourhood; and only about 50 per cent higher than that observed at the rural site at Harwell. Gaseous ammonia levels at Stockton were, however, about six times higher than those at Harwell, although it was clear that under most meteorological conditions these were dispersed without formation of excessive amounts of ammonium sulphate. It is the special meteorological conditions appertaining to the sea-mist situation which result in the formation of abnormal amounts of ammonium sulphate and consequent stabilisation of the mist.

There are no known effects on public health attributable either to ammonia or to ammonium sulphate at the maximum concentrations observed during the investigation. The presence of excess ammonia may even be beneficial, from both a public health and an agricultural point of view, in neutralising the sulphuric acid which would otherwise be formed from the sulphur dioxide by oxidation.

Considerable reductions in industrial emissions have occurred on Teesside since these AERE measurements were completed. At the ICI site at Billingham, conversion from coal to natural gas as a primary fuel has reduced sulphur dioxide discharges from 43,000 tons in 1969 to 1,500 tons in 1972—a reduction of 97 per cent. The closure of old plant and improved effluent suppression have resulted in substantial reductions in ammonia emissions. A further reduction in sulphur dioxide, of the same order, has been effected on Teesside by the replacement of open-hearth furnaces by the new BOS steel-making plant, which consumes no fuel. (Steps have been taken to reduce iron oxide fume from this plant.) The levels of industrial discharges which prevailed when investigation began in the mid-1960's no longer occur

in 1972. The reduction in pollution is reflected in an improved environment; there has been no serious episode of polluted fog in the Teesside area during 1971 and 1972.

The Working Group do not consider that further research on Teesside mist is necessary at the present time. They do, however, see a continuing need for monitoring of pollution and associated meteorological parameters on Teesside, particularly in view of the plans for further industrial development in the area. They believe that this need will be sufficiently covered by the extensive survey now being undertaken by the Teesside County Borough Council.

Development of heavy industry, particularly steel-works and petro-chemical plant, at coastal sites near to deep water, is likely to increase during future years. Experience, not only on Teesside but also in several cities overseas, suggests that due regard will need to be paid to the special meteorological conditions prevailing in coastal locations; and that, if the occurrence of polluted coastal fogs and high-pollution episodes is to be minimised, full advantage will have to be taken of modern techniques of air pollution control.

*The members of the working group were:*

Chairman:	Dr. C. C. Hall (1st meeting only) Dr. S. R. Craxford	Warren Spring Laboratory
Members:	Dr. V. T. Brooks Dr. A. E. J. Eggleton Professor W. B. Fisher	Northern Regional Office, Department of Trade & Industry Health Physics & Medical Division, Atomic Energy Research Establishment Department of Geography, Durham University
succeeded by	Dr. J. M. Fletcher Dr. H. A. C. McKay Dr. A. G. Forsdyke	Chemistry Division, Atomic Energy Research Establishment Meteorological Office
succeeded by	Mr J. H. Brazell „ „ Mr. M. H. Freeman	
	Dr. E. T. J. Fuge	District Alkali and Clean Air Inspector
succeeded by	Professor P. J. Lawther Dr. J. McK. Ellison	Air Pollution Unit, Medical Research Council
	Dr. B. Leadbeater	Agricultural Division, Imperial Chemical Industries Ltd
succeeded by	Dr. E. A. J. Mahler Mr. M. F. Tunnicliffe	Alkali and Clean Air Inspectorate
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Secretary:	Mrs. M.-L. P. M. Weatherley	Warren Spring Laboratory

# SCRAP AND THE ENVIRONMENT

by

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## Introduction

The recovery of metals by the processing of scrap into re-usable material is an essential part of the national economy. It is also a potent source of environmental pollution about which we have discovered much in recent years but still have much more to learn.

My purpose in this paper is to discuss the air pollution aspects of scrap metal processing, the present UK position, and to point some needs for the future.

Excepting the specialised control of air pollution from some basic industrial processes by the pre 1958 Alkali Works Inspectorate, general air pollution in this country was largely uncontrolled until the 1956 Clean Air Act. This Act, engendered by the notorious 1952 London smog, has brought about quietly a remarkable revolution in the air pollution picture of this country. Its principal target has been smoke from combustion installations, industrial, commercial and domestic, and its success in this field is evident, both to the senses of all who are old enough to remember the filth and the fogs of our towns and cities only 15-20 years ago, and in the measurements of smoke made daily throughout the country in one of the largest and most continuous air pollution surveys operating in the world.

To be true, this success is not uniform across the country and there are still too many smoking domestic chimneys in certain areas, but progress is continuing and in 1972 a record number of Smoke Control Orders were made.

At the time of the passing of the first Clean Air Act, several industries including the Metallurgical industries represented to an official Inquiry headed by Sir Frederick Armer that they were unable to meet the proposed smoke grit and dust controls of the Clean Air Act. The case was made that this arose not from an unwillingness to cure their air pollution problems, but simply because the nature of the processes did not allow a change of fuel, or attention to process control, sufficiently to prevent emissions to the extent required by the Act.

So it was that several industries in the metallurgical field, and engaged heavily in the recovery of metal from scrap, became scheduled processes under the Alkali and Works Regulation Act of 1906.

The Alkali Acts had begun in 1863 to control the offensive and damaging discharge of hydrochloric acid gas from the Alkali Works, the starting points of the basic chemical industry in the latter part of the 19th century. Successive Acts have extended the control of the inspectorate to other chemical processes, but the

name remained and is still with us today as a reminder that this country possesses the oldest functioning air pollution control in the world.

By 1906 the Alkali Act had reached a fully developed state and since then all that has been found necessary has been the extension of the schedule of controlled processes and the list of controlled pollutants. This has been done by successive Orders, at present represented fully by the consolidating Order of 1966 and an extending Order in 1971. It was by the Order of 1958 that the Iron and Steel Works, Copper Works and Aluminium Works were brought under the Act. Lead Works had been scheduled in 1939 and Zinc Works were, in a more restricted sense than at present, already under the Act of 1906.

In the 1961 and 1963 Orders other metal processing including uranium, beryllium, selenium, chromium, magnesium, cadmium and manganese were brought within control, and also the specific scrap recovery process of cable burning. To all of these processes the basic requirement of the Alkali Act applies. The wording may be familiar to many of you but in order to demonstrate its full meaning the complete wording is as follows: —  
“The owner of ( . . . a scheduled work) shall use the best practicable means

for preventing the escape of noxious or offensive gases by the exit flue of any apparatus used in any process carried on in the work,  
and for preventing the discharge, whether directly or indirectly, of such gases into the atmosphere,  
and for rendering such gases where discharged harmless and inoffensive.”

This can be seen to be a requirement for the installation of suitable plant for the prevention of emissions and their effective dispersion where discharged. But the Alkali Act goes much further than this and exerts control of the operation of the process also:

“The expression ‘best practicable means’, where used with respect to the prevention of the escape of noxious or offensive gases has reference

not only to the provision and the efficient maintenance of appliances adequate for preventing such escape,  
but also to the manner in which such appliances are used  
and to the proper supervision, by the owner, of any operation in which such gases are evolved.”

These two sections of the Act, combined with the requirement of registration and the subjection to inspection at any time, give a more complete system of control and enforcement than any other air pollution code operating at this time.

## Process Emissions

The case that was presented to the Armer Inquiry in 1957 was for the control of smoke emission under the "best practicable means" provisions of the Alkali Act rather than the less flexible control of the Clean Air Act. The contention was that smoke emission arose more from the materials being processed than from the firing of the furnaces. However true this was, the inspectorate found soon after assuming control responsibility that they were faced with a much wider and more intractable range of emissions than simple carbonaceous smoke. It has been the concurrent presence of other pollutants with carbonaceous smoke that has provided some major difficulties in preventing emissions. In addition to metallic and metal compound fumes, emissions containing salt, fluorides, hydrogen chloride, oil mists, incandescent particles and obnoxious smells have all been encountered, and although smoke as such has largely been eliminated, control of the other emissions still presents some unsolved problems.

It would be no exaggeration to say that the state of cleanliness of the scrap entering the recovery processes has a major bearing on the quantity and quality of the emissions that are to be controlled, and that the severity of the control problems encountered could be greatly reduced by effective pre-treatment of the input materials. Contamination of the environment by metals is becoming an area of increasing concern and public scrutiny and it is to the individual processes that we now turn.

## Metal Processes

### Aluminium

For this meeting today the primary production of aluminium with its attendant fluoride evolution is not relevant, and only the secondary production from scrap fabricated metal or residues will be considered.

The two main emissions which had to be tackled by the industry in conjunction with the Inspectorate were smoke from oil or paint contamination of the scrap and salt flux cover used in many furnaces and particularly in rotary furnaces.

Lesser emissions, though still significant in the industry, were dust from dross recovery operations and fumes from both magnesium removal and degassing processes where chlorine was used.

Smoke arising from the melting of oily swarf can now be entirely eliminated by pre-treatment methods, of which the most prominent is the thermal dryer fitted with an after-burner. The latter must be maintained at a high temperature sufficient to burn smoke and oil vapours under varying load conditions, and automatic controls have been successfully developed.

On the latest dryers a small amount of fine particulate aluminium can be separated from the final flue gases by multicyclones.

With this practicable method now available smoke emission from the processing of oily swarf is no longer a question of technical difficulty and is unacceptable.

An equally good pre-treatment for larger scrap sizes has not yet been produced and smoke emission has still a high potential in the remelting of foil, painted sheet, greasy castings, etc. With flame-fired furnaces

combustion conditions and rates of charging can be, and have to be, adjusted to prevent smoke emissions, but this is not possible for the electric induction furnace. For this furnace selection of clean scrap is the only solution yet devised.

The emission of salt fume from secondary metal recovery has been a particularly difficult problem for both the industry and the Inspectorate, and as arrestment plant will be a requirement on all furnaces from the end of this year there is no room for illusions. Careful operation and good maintenance will be essential if satisfactory performance is to be achieved.

In the early 1960's laudable attempts were made to remove salt fume by electrical precipitators, but were defeated by rapid and severe corrosion. Reliance is now being placed on high energy wet washing systems or fully dry fabric filters. The former, typified by the venturi scrubber, has to overcome the corrosion potential by very careful choice of expensive materials of construction and be prepared to carry expensive spares. The final emission is saturated: a chimney suitable for the steam plume discharge is needed and spray carry-over must be avoided.

The dry fabric filter must be preceded by a cooling system to obtain a gas temperature consistently below the maximum working temperature of the fabric but the temperature must also be kept always above any condensation conditions. This is not easy to achieve, particularly with a batch operating process. Filters must be very adequately insulated—an indoor location is preferable, and start-up heaters are needed. The salt fume is hygroscopic, even deliquescent, and ingress of cold air will need to be prevented.

A fabric filter will not remove gaseous components of the emission, such as traces of hydrogen chloride and hydrogen fluoride, or sulphur dioxide from the furnace fuel and so a final chimney is also needed.

The Chief Inspector's general requirement for fume emission is that it shall be cleaned to the point of near-invisibility. For salt fume arrestment this has been taken as equivalent to a total particulate concentration of 0.05 grain/cu ft at STP (115mg/cu m).

With the difficult problems this industry is having to face it is at least pleasing to record that emission of toxic metals from secondary aluminium melting appears to be minimal. An inadvertent emission of selenium is known, caused by an unsuspected parcel of selenium coated alloy in the scrap charge, but such events seem to be a rarity.

In dross recovery operations standard dust collection systems can be used without undue difficulty.

In the area of degassing and magnesium removal the need to control emissions has had a marked technological effect and has led to the invention of improved methods with much lower emission potential. This is progress especially gratifying to the Inspectorate, because it has been part of our philosophy for many years that it is better to suppress emissions at source rather than to have to cope with them afterwards.

### Arsenic

Although not regarded as a true metal arsenic occurs widely as an impurity in ores and can be found also

in some secondary metal processes. Control has been exercised by the Alkali and Clean Air Inspectorate for many years and an emission not exceeding 0.05gr  $\text{As}_2\text{O}_3/\text{cu ft}$  (0.12 g/cu m) for volumes less than 5000 cfm, or 0.2gr  $\text{As}_2\text{O}_3/\text{cu ft}$  (0.046 g/cu m) for larger volumes, is regarded as complying with the best practicable means requirement.

Perhaps the largest source of arsenic emission in the metallurgical industries occurs during tin smelting from the ore. The emissions can only successfully be controlled to the required levels by high efficiency gas cleaning plant. The production of arsenical copper has declined greatly in recent years but some scrap is still arising. Emissions from the recovery of this are not causing any known problems at this time.

A much more insidious and dangerous form of arsenic emission is arsine, which can be produced in the wet treatment of salt slags from aluminium recovery and at some stages of electrolytic copper refining. Careful process supervision is always needed, but amounts of arsine known to be evolved are slight.

#### *Antimony*

Less widespread than arsenic and mostly confined to the lead recovery industry. The inspectorate's emission standards are the same as for arsenic.

#### *Beryllium*

This is the most toxic metal known and the Inspectorate takes a rigorous view of its responsibilities in preventing emissions from any beryllium processing. Copper-beryllium alloy is the form mostly encountered and emission standards are strict. "Absolute" filters are used satisfactorily for some installations; others have employed electrical precipitators in series so that failure of any one precipitator does not materially increase the escape. A final emission limit of 0.002 mg/cu m has been required in some instances but each works is assessed and dealt with individually.

#### *Cadmium*

Much environmental concern has been expressed recently about cadmium though mainly in connection with water pollution. Discharges to the air from scheduled cadmium processing are controlled strictly by the Inspectorate, and the maximum that is accepted as complying with "best practicable means" is a concentration of 0.017 grain/cu ft (38 mg/cu m) STP and a mass amount of 33 lb (15 kg) per week of 168 hours.

High efficiency gas cleaning plant is mandatory for master cadmium-copper alloy manufacture but in the production of re-melting of low cadmium alloys losses to the air have been found to be within the limits set and in these circumstances dispersal from a sufficiently tall chimney has been accepted.

In cadmium alloy processing, as also with beryllium, containment of fumes at the furnace needs to be of a high standard of efficiency, and some good furnace hood designs now exist.

#### *Copper*

When the copper and copper alloy industry appeared before the Armer Inquiry in 1957 it contended that smoke from the pouring of alloys into grease-dressed moulds, and smoke from the poling of copper refining furnaces with green wood, were major problems defying a solution that would enable the industry to comply with the Clean Air Act.

These then were the processes originally scheduled under the Alkali Act in 1958, and the cause of some surprise to inspectors when they began to visit the works which were now their responsibility. A subsequent Order amended the definitions of the scheduled processes to accord better with the emission problems.

The copper industry presents a complicated picture and it will be helpful to sub-divide the processes into:

- (a) production of refined copper from scrap or residues
- (b) production of alloy ingots from scrap
- (c) wrought copper or copper alloys

In the production of refined copper the process equipment is typically a cupola furnace followed by a converter and a poling furnace or the classical 24-hour cycle reverberatory furnace. In both air is used as a refining agent, and in both there can be substantial emissions of smoke from carbonaceous material, and metallic fumes. For the cupola/converter system in which low grade scrap and residues form a large proportion of the copper input large, high capacity and high efficiency gas cleaning equipment is essential, and the successful operation of this under varying load and temperature conditions is no mean achievement.

In the reverberatory furnaces process high efficiency arrestment is required when air blowing is used for the deliberate removal of zinc from the charge. Where this is not used dispersion of the furnace gases from tall chimneys has been accepted, as fume concentrations are lower than in the other processes. With the increasing attention being paid to metallic contamination of the environment this policy is now under review, and emissions of copper zinc and lead in particular are being examined.

A feature of the use of low grade scrap in cupola furnaces has been the characteristic and acrid odour of the filtered gases. The exact cause of this has not been fully established. The presence of plastic in the charge material has been suspected as the cause but not proven, and the only cure for local complaint has been final dispersion from tall chimneys.

Reverberatory, rotary and crucible furnaces are used in copper/copper alloy ingot production, and the charge material is usually well-selected scrap. High efficiency fume arrestment plant is required whenever air is used deliberately for the removal of zinc from the melt, but its use is extending to cover the whole furnace cycle. The rotary furnace can be a particularly potent source of metallic fume emission. High lead content alloys can lose lead during their production at a greater rate and concentration, than is permitted from a lead smelting process. The environmental concern over lead is discussed later, but all that need to be said here is that the copper alloy process emissions are being given increasing attention and scrutiny by the Inspectorate, and that the British Non Ferrous Metals Research Association is closely involved in the work in co-operation with the Department of the Environment.

In the wrought copper and copper alloy industry the predominant melting unit is the electric induction furnace, with a smaller number of crucible furnaces. Smoke emission produced during casting into grease-dressed moulds was the original reason for scheduling under the Alkali Act, but is only one facet of the total emission which is principally zinc oxide and some

smoke from the furnace charge. Smoke emission on casting varies with individual works practices and with mould shape, and is still an unresolved problem. Continuous casting methods are a solution but not yet applicable throughout the industry.

It is with the smoke and zinc oxide emission from the scrap charged to the furnaces that the greatest problem has arisen. Dry fabric filter plants have been the preferred method for arrestment of this emission and almost without exception they have caught fire at some time in their life. For several firms the financial burden of repair and replacement has been excessive and it has been necessary for the Chief Inspector to allow provisionally for dispersion from chimneys until the problem could be overcome. The mixture of finely dispersed carbon and zinc oxide seems to be highly susceptible to firing and several theories have been advanced to explain this. None is yet fully proven. The problem seems to be more acute where quantities of oily swarf are charged to the furnaces and thereby incomplete combustion produces a higher carbon content in the collected fume. In some instances surges of high temperature gases or incandescent particles seem to have been the most likely causes of firing in the filter, but several cases are also known where collected fume has fired some hours or even days after discharge from the filter plant.

Injection of an inert powder, such as pulverised fuel ash or limestone dust, into the gas stream before the filter has been suggested as a possible way of preventing the development of a fire but practical application of this has not yet met with complete success.

At some large works the solution has been found in de-oiling the swarf before charging to the furnaces. Although chemical degreasing is possible the preferred method has been the thermal dryer originally developed for aluminium swarf. By this means problems in the collection of furnace fumes are greatly reduced but in doing so a secondary emission can be caused. This arises when leaded brass swarf is being dried. Tests made by the industry and by the Inspectorate soon after commissioning of the first swarf dryers to be used on brass swarf showed significant lead concentrations in the chimney gases. The source of this lead emission from an essentially low temperature drying operation was at first obscure but later work has pointed to the after burning stage where smoke and oil volatiles are combusted. Fine particles of brass swarf can be carried up with the dryer gases and exposed to the high temperature flame conditions. Oxidation of the particles leads to an emission of lead and zinc. This aspect has been studied by the British Non Ferrous Metals Research Association and it has now been shown that the use of cyclone arrestment can reduce the emission to acceptable levels.

Throughout the time since the copper industry was scheduled the co-operation and expertise of the British Non Ferrous Metals Research Association has been of inestimable value, and a striking example of how industry and government can work together for the good of the whole community. BNFMR is currently engaged on further work on emissions, particularly of lead from copper alloy processes, under contract to the Department of the Environment.

## Iron

Although by definition this is not a subject for a meeting on non-ferrous metals it would be inappropriate for mention not to be made that very similar problems of emissions arising from scrap contamination do occur in the iron and steel industries. Smoke produced from oil contaminated metal, particularly borings, can be dealt with by similar methods adopted in the non-ferrous industries. The melting of low grade scrap to produce pig iron ingot is accompanied by lead and zinc emission, and in a short survey of emissions made by the Inspectorate a few years ago lead losses as high as one pound per ton of ferrous scrap were found. Even with cleaner grades of scrap used in arc furnaces and foundry cupolas lead emissions can be significant. The whole subject is under careful scrutiny by the Inspectorate.

## Lead

This metal is so much a matter of present public concern that it will be helpful at the outset to look at the Alkali Act definition of a scheduled lead works:—

"Works [not being works for the recovery of lead from scrap by direct liquation] in which, by the application of heat, lead is extracted from any material containing lead or its compounds, and works in which compounds of lead are manufactured from metallic lead or its compounds by dry processes which give rise to dust or fume."

The original scheduling of lead works according to this definition was in the 1939 Order. The words in brackets were added in 1963 as tests had shown that losses of lead fume from the low temperature melting of lead were insignificant compared with the losses from higher temperature refining operations.

Emissions from lead processes which do not fall within the definition, for example lead melting, are the statutory responsibility of local authorities implementing the Public Health Act, but at all lead works the protection of employees is supervised by HM Factory Inspectorate.

The Inspectorate has always regarded control of lead emissions as one of its major responsibilities and has given high priority to the regular visiting and sampling of emissions, without prior notification. If it is any comfort, it is worth recording that no other country has such a record of control or system of enforcement, and at least until very recently no other country had specific limitations on lead emission. In 1972 a total of 961 samples were taken for analysis for lead, or lead in conjunction with other metals, from both lead works and other metal works. In recent years the average emission from scheduled lead works has been in the range of 0.012-0.020 grain/cu ft (29-46 mg/cu m).

The recent cause for concern about lead works has not been on account of excessive emissions from the processing plants but from the realisation that lead may be entering the local environment in a variety of ways, and that the resulting accumulation of lead in the soil, vegetation, buildings etc may become a source of danger.

Surveys of blood levels of people living around the larger lead works have been conducted in the past 18 months, and while no clinical symptoms of lead poisoning have been detected elevated levels compared with control areas have been found. The risk is higher for

young children who, playing on soil or streets, can absorb more lead than adults, and who additionally may be more susceptible to long term lead effects than adults with comparable blood lead levels.

The emission of lead from process vents is only one of the ways that lead can pass into the surrounding areas. Dust can be blown from stockpiles or from internal roadways. It can be taken out on workers' clothing or footwear, and this is proven by comparison of the blood lead levels of lead workers' families with others. Vehicle wheels and works rubbish removal are other routes. The Inspectorate takes a broad view of its responsibilities on registered works and is giving careful attention to all points where lead can escape to the outside environment. The strictest control must always be exercised if the local community is to be adequately protected.

Much of what has just been said can apply also to other non-ferrous metal works where lead-containing materials are handled, and a particular attention should be given to the disposal of collected fume or dust.

On the lead processes themselves there is little of especial comment. Remelting and refining of scrap metal and residues is carried out in cupola furnaces, reverberatory or rotary furnaces, and high efficiency gas cleaning plant is required. Particular attention is necessary to see that all sources of lead fume are contained and treated.

### *Zinc*

The recovery of zinc by remelting of scrap metal is not a scheduled process under the Alkali Act as the air pollution potential in typical operation is not significant.

The recovery of zinc from residues is a scheduled process and the recovery in particular from galvanisers residues, or "ashes", can evolve dense fumes of zinc and ammonium chlorides from the flux material present in the residues. This is another case where pre-treatment is effective, as simple crushing and screening of the residues removes a large proportion of the non-metallics, and fume evolution from the cleaned metallics is sufficiently light to allow dispersion from a chimney to be accepted.

### **Cable Burning**

This particular process has been separated from the foregoing discussion of the various metal processes because of its special features and difficulties inherent in control of emissions.

The process was scheduled in 1963 through the recognition of the growing use of polyvinylchloride for electrical cable insulation, and the likelihood of increasingly troublesome emissions as more PVC insulated cable began to be scrapped. At first it was thought that phosgene would be the most important and dangerous component of the emission when scrap PVC insulated cable was incinerated for recovery of the metal, but these fears now seem to be ill-founded. If any phosgene is formed it is small in amount and being thermally unstable appears to be totally destroyed in the after-burner which is a requirement on cable-burning furnaces.

The chlorine component of the PVC instead appears mostly as hydrogen chloride in the emission, with probably some metallic chloride or oxychloride fume.

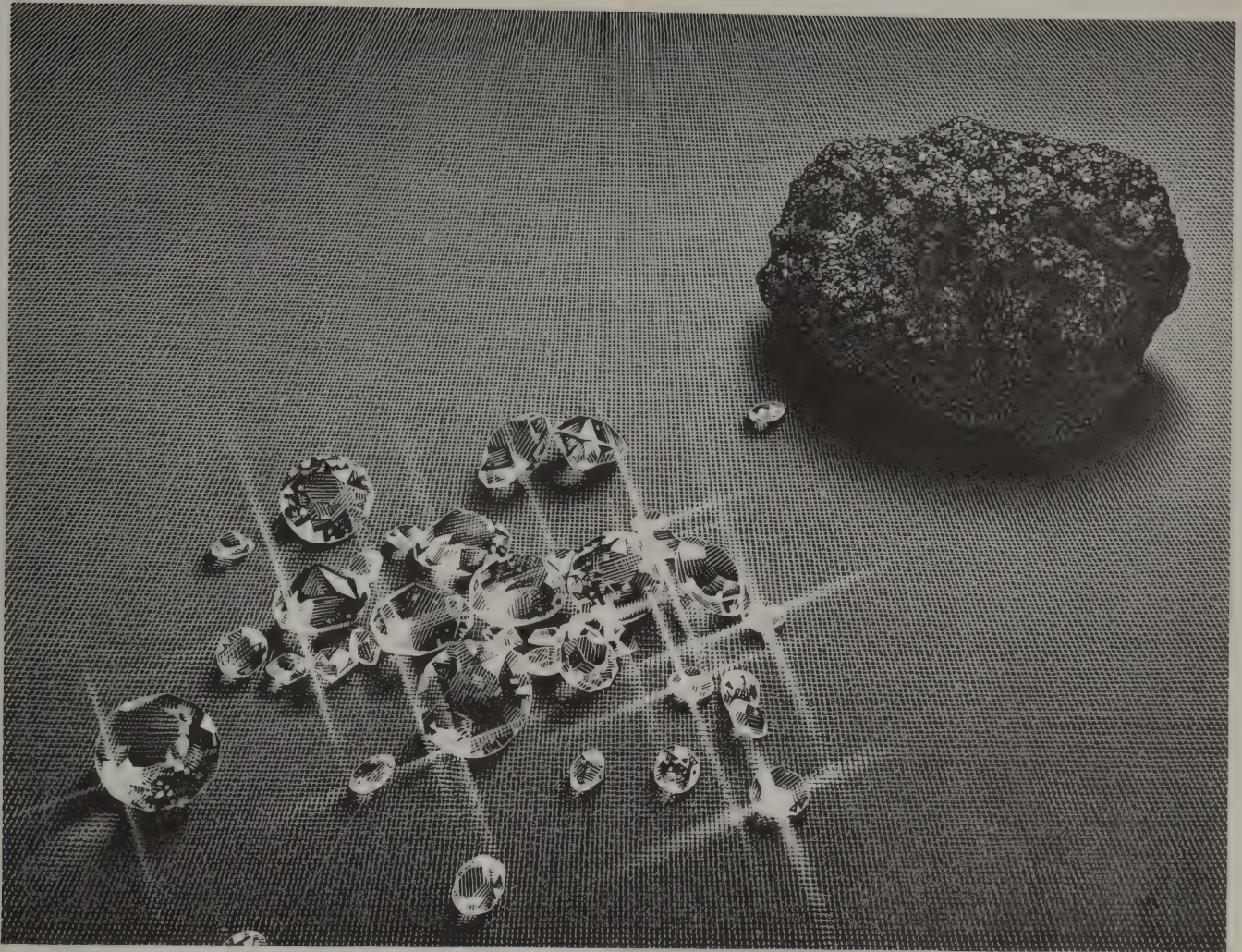
The cable burning trade is notorious for being shared between on the one hand a small number of normal industrial firms and on the other hand a host of itinerant and often disreputable operators. The Inspectorate is not effectively organised to chase the latter up and down country lanes, often by night, and the blunter weapon of prosecution has had to be used more times with them than any other class of scheduled works. The evidence of Public Health Inspectors has assisted more than once in prosecuting.

Control of emissions at the respectable works, with proper furnace facilities, has pitfalls. Smoke from the low temperature enclosed incineration can adequately be consumed by efficient and well maintained after-burners but to reduce the hydrogen chloride content to below the Inspectorate's standard of 0.2 grain/cu ft (460 mg/cu m) requires an efficient and robust wet washing system. The fluctuating thermal output of the furnaces and the varying emission during the incineration cycle put great strains on the scrubbing plants and successful operation needs continual and careful supervision. Even with a well-operated afterburner some carbonaceous material passes through to the scrubbers and causes difficulties either with blockages of the packing, sprays and pumps, or by passing through into the chimney. Here it can agglomerate under the warm saturated conditions into wet flakes of soot, breaking off from time to time to be emitted from the top of the chimney and causing intense complaint from the surroundings.

This is another process where the difficulties with emission control eventually produce new methods of processing. Cable shredding machines are now available which can take the greater part of the scrap cable arising and recover high-grade conductor metal without incineration. It is again the "contaminated scrap," where PVC-insulated cable is hopelessly mixed together with other types, that causes the incineration process to be retained. The technically possible use of dry-filtration combined with an absorbent solid does not appear yet to have been tried.

### **Future needs**

Concern about the accumulation and the effects of metals in the environment has grown greatly in the past few years and is unlikely to recede. Better and more detailed knowledge about effects may diminish concern in some areas but may increase it in others. In addition higher community standards for clean air are being demanded. The various metal industries face a common problem in dealing with this situation. Interchange of ideas and expertise has been limited in the past and the cloak of commercial secrecy has covered much that was not really so essentially confidential for a company's prosperity. There is scope for an interchange of information on the design of containment hoods on furnaces, on the design parameters for arrestment plant, and on general trouble-shooting. The Alkali and Clean Air Inspectorate has always tried to help in these respects within the limits of commercial confidence, but this is not really its task or responsibility neither is it organised to do the work on behalf of others. Industry has the responsibility to protect the community from any ill-effects of its operations, and this Symposium will do much useful and good work if it helps the non-ferrous metals industry to take another careful look at its emissions.



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Coalite, like diamonds, is precious.**

Carbon is a pretty surprising element. It turns up in some wild guises. Like diamonds. Men have killed for them. Women have succumbed for them. Fortunes have been founded on them.

Diamonds are precious.

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**Coalite**  
Fresh Air Fiends

# THE SECONDARY METALS INDUSTRY AND THE ENVIRONMENT

by

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Virtually all of the secondary non-ferrous metals industry is scheduled under the Alkali Act. It follows, therefore, that emissions from the industry are under close surveillance and are carefully controlled. The possibility of pollution by dust, smoke and fume is, in fact, the major environmental concern of the secondary metal refiners, and is the main theme of this paper. There is little liquid effluent arising in the treatment of secondary metals. Solid wastes, such as fluxes and slags, present a minor problem in their disposal for some sections of the industry, though for the most part the slags are inert and non-toxic. Noise has only comparatively recently been recognised as a form of pollution. The problems of noise are not peculiar to the secondary metals industry and noise is not discussed in this paper, although its importance as an environmental issue is rapidly achieving recognition.

Broadly, the potential emissions from the industry comprise dust and fine metallic particles, smoke arising from the combustion of organic coatings on metals, oil contaminating the raw materials used and sometimes from the insulating dressings applied to moulds, and fume consisting mainly of metallic oxides in the sub-micron particle size range. In the secondary aluminium industry there are also emissions of volatile chlorides and fluorides, some of which can undergo hydrolysis to yield the corresponding acids.

Data on the extent of the problem is extremely scanty. A certain amount is available from work done by the British Non-Ferrous Metals Research Association at the request of H.M. Alkali and Clean Air Inspectorate some years ago.<sup>1</sup> This covered much of the secondary aluminium industry, but included relatively few of the operations involved in the secondary copper alloy industry or the lead industry. At the behest of the Inspectorate the data for the secondary copper alloy industry is now being considerably extended. An attempt to give an overall picture of particulate emissions from industrial sources has been made in the United States,<sup>2</sup> and this includes emissions from the secondary non-ferrous metals industry. The total tonnage of particulates emitted by a given industry has been calculated from four quantities:

- 1 An emission factor for the uncontrolled source:
- 2 The total tonnage processed per year by the industry:
- 3 The efficiency of control equipment used:
- and
- 4 The percentage of production capacity equipped with control devices.

The study is based on production data on each major particulate pollutant source for the 1947-68 period, when emission control was of much less concern than it is today.

The annual total of particulate emission from industrial sources in the United States was calculated to be about 18,000,000 tons. Of this the secondary non-ferrous metals industry was calculated to contribute 127,000 tons, or about 0.7%. The particulate emission from the secondary copper industry was claimed to be 60,000 tons per year in treating 1,170,000 tons of scrap. However, 41,000 tons of this emission was attributed to the burning of insulation from wire which, at that time at least, was completely uncontrolled in the United States. In contrast, in the United Kingdom the operation is scheduled under the Alkali Act and emissions are controlled at a low level. The emissions from the secondary aluminium industry of the United States are stated as 58,000 tons per year for a scrap recovery of just over 1,000,000 tons and 51,000 tons per year of this is calculated to arise from chlorine fluxing, presumably for the removal of magnesium. The secondary lead industry is said to produce 4,000 tons per year of particulate emissions for a production of some 500,000 tons of secondary lead, and the secondary zinc industry 5,000 tons per year. Whereas the application of control is suggested to be 95% in the United States secondary lead industry, it is indicated as being low in the secondary zinc industry, aluminium industry and copper industry. These figures for past performance of the United States secondary non-ferrous metals industry, suitably scaled down to United Kingdom production levels, give some idea of what the position might have been but for the strenuous efforts to abate emissions which have taken place over the past fifteen years.

Emissions of dust, that is, particles of size greater than, say, ten microns diameter, present only a minor problem, as such particles can be collected in settling chambers, cyclones and similar devices. Obviously good housekeeping is necessary in order to prevent the escape of dust in the works area, since the smaller particles can be spread around by wind or traffic. The dangers when such dusts contain toxic substances will readily be apparent. However, it is the material of micron and submicron size, fume, that gives rise to problems. The diffraction of light by these small particles makes such emissions clearly visible, and they thus have a nuisance value quite apart from any considerations of toxic hazards. Only high efficiency collection equipment such as fabric filters, high pressure drop scrubbers or electrostatic precipitators is adequate to the task of collecting such particles. Such collection equipment is costly to install and is also costly to operate and maintain. By

and large it represents a completely unproductive investment for the industry since rarely is it possible to recover material of sufficient value to repay the cost of collection. Since the capacity of the equipment required depends mainly on the volume of gases to be handled—the concentration of particles in the gas stream is rarely a limiting factor—it is of the utmost importance to consider the whole of the plant operation in order to determine whether the volume of waste gases can be reduced before embarking on a programme of capital expenditure on collection plant.

### Pretreatment to Reduce Emissions

Emissions of fine particulates occur during melting and refining mainly as a result of the volatilisation and immediate oxidation of some metals, and, particularly in secondary aluminium refining, from volatilisation of fluxes. With some types of scrap, however, there is also a serious problem of smoke and fume emission from oil and other organic material entrained with the metal. Two important examples of this are in reclaiming scrap copper cable and in recovering machine shop swarf and borings. It is now common to pretreat these materials in order to reduce the pollution problems in subsequent melting.

### Treatment of Scrap Cable

Much high quality copper is available to the secondary metals industry in the form of scrap cable which may be insulated with a variety of materials ranging from PVC to cotton. Formerly this insulating material was removed by burning, and in fact this is still the only practicable method for certain types of cable. However, it involves serious emission problems. Complete combustion to avoid emission of dark smoke can be secured by means of an after burner following the combustion chamber, but the combustion of PVC yields noxious chlorine compounds and the emission of lead is also a hazard where lead compounds are incorporated in the plastics. To overcome completely the emission problems it would be necessary to employ high efficiency scrubbers to clean up the exhaust.

Because of these difficulties, large operators have turned to mechanical means for effecting the separation of the insulating material. Special machines have been developed<sup>3</sup> in which the cable is chopped into short lengths from which the plastic is broken away. The two components are then separated by a kind of winnowing process. Although this air separation is fairly effective, it is frequently the practice to employ a further treatment to make a complete recovery of the copper. Separation of the plastic from the copper on a Wilfley table is one method, and a more elaborate procedure uses a fluidised bed.<sup>4</sup> This mechanical method of treatment is most effective for PVC insulated cable, but it is generally considered that burning is the only satisfactory method for treating some types of cable scrap and bales of mixed scrap are difficult to deal with by other means.

### Removal of Oil from Swarf etc.

Swarf and borings from the machining of aluminium, brass etc. retain a substantial quantity of lubricant, and it is virtually impossible to melt the untreated swarf without giving rise to copious black smoke. When brass swarf is being melted there is also loss of zinc through volatilisation producing zinc oxide fume. A typical analysis of this emission would be about 60% zinc oxide, 10% fine metallic particles and 30% carbon. The emission of dark smoke is prohibited except for

very limited periods under special circumstances, and it has therefore been necessary to find means for coping with this type of fume.

Some years ago, International Alloys Ltd. developed a rotary kiln for treating safely oil contaminated aluminium swarf. Essentially this consists of a rotating drum through which the swarf is propelled by "flights". The first part of the drum is indirectly fired and in this portion the oil is driven from the swarf, ignited and partially burned. Once started there is usually sufficient heat generated by the burning oil vapour to maintain evaporation. The central portion of the drum is the drying zone in which evaporation of the oil and water is completed and the swarf then passes out through a cooling zone. Air is admitted to this zone to assist in cooling, and this preheated air passes down the drum counter to the flow of swarf and aids evaporation in the drying zone. The air and combustion products exhaust into a directly heated after burner, normally sited on top of the drum, where all combustible products are eliminated, and thence to a stack. Temperature control effected partly by control of the swarf feed and partly by the introduction of water prevents vigorous combustion from spreading along the drum into the evaporation zone and hence oxidation of the swarf is at a minimum.

Although this equipment, known as the Intal Dryer, was in use in the aluminium industry, it was not at first employed for de-oiling brass swarf which was at that time melted without pretreatment. To overcome the accompanying air pollution problem, attempts were made to collect the carbon containing fume in fabric filters and several bag houses were installed for the purpose. Almost all of these suffered spectacular and disastrous fires. Increasingly elaborate steps were taken to prevent hot particles reaching the filters and to reduce the temperature in the filters in order to reduce the chances of ignition, but fires continued. It became clear that the high proportion of carbon in the fume produced when melting oily brass swarf rendered the collected dust pyrophoric, and there are few instances of the successful operation of bag house plants over long periods with this type of fume. One filter manufacturer has claimed success as a result of closely controlling not only the conditions for collecting the fume, but also the entry of air during bag cleaning.<sup>5</sup> Recently it has also been reported that a plant has functioned satisfactorily as a consequence of injecting a proportion of finely divided lime into the bag plant, a practice sometimes used to protect fabric filters against attack by acid gases.

However, all large users of brass swarf in Europe have turned to removing the cutting fluids prior to remelting the swarf. The obvious approach of centrifuging did not give a sufficiently satisfactory separation of oil and even a combination of detergent washing and centrifuging was unsuccessful in reducing the oil content of the swarf much below 1%. Solvent degreasing was considered and indeed is still under experiment, but the magnitude of the solvent losses is an unknown cost factor, and there is also a potential hazard from the carry-over of trichlorethylene with the swarf. Fortunately, experiments with the Intal Dryer applied to brass swarf were completely successful and thermal de-oiling has now become almost standard practice. Its use has resulted in considerable improvements of the conditions in foundries, quite apart from minimising the smoke emission problem. In a detailed account of the

	Tests on 183 tonne (180 ton) furnace while firing with oil		Melting off		Oxidising		Poling	
	Charging and "Melting to Flat"		Bottom					
	Lowest Average (15)	Highest (15)	Lowest Average (5)	Highest (5)	Lowest Average (7)	Highest (7)	Lowest Average (6)	Highest (6)
Average gas temperature during test, °C		187		182		182		176
Volume in stack at temperature, m <sup>3</sup> /min.		580		603		695		545
Volume at NTP, m <sup>3</sup> /min.		340		354		410		325
Dust burden at NTP, g/m <sup>3</sup>	0.15	0.80	0.30	1.00	0.37	1.14	0.28	0.66
Kg of dust emitted/hr.	3.08	16.33	6.36	20.9	9.00	28.00	4.65	12.70
		8.16		9.90		18.3		9.05
% copper in the dust	8.7	49.0	19.6	37.7	18.3	42.5	24.2	50.0
		32.2		29.9		37.1		39.7
Copper emission g/m <sup>3</sup> at NTP	0.04	0.37	0.06	0.34	0.15	0.40	0.14	0.23
		0.14		0.15		0.23		0.17
Kg copper emitted per hour	0.79	7.50	1.27	7.05	3.82	9.55	2.70	4.70
		2.80		3.08		5.88		3.37

de-oiling of brass swarf, Gies<sup>6</sup> estimates the stack emission to be 0.4 g/Nm<sup>3</sup> and the cost of oil removal between £1.20 and £1.70 per tonne according to throughput. More recent installations have included dust collectors which have considerably reduced the level of emissions.

### The Secondary Copper Industry

A considerable tonnage of scrap copper is recovered annually, a proportion of this being finally electrorefined. The "working-up" processes employed vary with the quality of the scrap. The higher quality scrap requires no more than a conventional fire-refining treatment in reverberatory furnaces, though if the tin and lead content of the scrap is high a forty-eight hour cycle may be considered necessary. Obviously there can be considerable variation in the emissions according to the method of working and the type of charge. Some typical figures for a large furnace refining fairly high grade material is given in Table 1.

Dispersal of the fume through the tall stacks with which these furnaces are usually equipped is often considered adequate, but if the charges contain sufficient volatile impurities like lead and zinc collection of the fume may be necessary.

Low grade material may be treated in a blast furnace to produce "black copper", followed by oxidation and fluxing either in a converter or in a reverberatory furnace, and collection of the fume is necessary. The most common method of collection in all these cases is to use bag houses. The fume has obviously to be cooled considerably before it can be safely led into the bag house. Sometimes a water spray tower is used, e.g. with blast furnaces which are close coupled to the exhaust ducting. In other cases, e.g. with converters where the hooding leads to considerable dilution with air, simple coolers to radiate heat or extra long trunking is used. Wet collection using high pressure drop venturi scrubbers is also practical, though it is not common. Stainless steel equipment seems to have adequate corrosion resistance. The water is recycled from a sump in which the particulate material collects, and the sludge is eventually pumped to a thickener to effect a better separation.

Fume collected in bag houses coupled to converters is usually sufficiently rich in tin oxide to be saleable for recovery of the tin. There seems to be no market

for contaminated zinc oxide fume otherwise, although if the oxide is converted to sulphate and the zinc sulphate purified there is a market in the textile industry and in animal feedstuffs.

A large proportion of the scrap arising in the copper industry can be converted into recognised specifications without resorting to complete refining to remove all impurities, and most of the gunmetals and bronzes and brasses used in the foundry industry are made in this way. It is frequently necessary to reduce the zinc content of this scrap by blowing air into the molten metal. The fumes of zinc oxide produced are too copious to be discharged to atmosphere, and in fact the industry is required to restrict the emission of fume during this blowing sequence to a maximum of 0.12 g/m<sup>3</sup>. Bag houses, protected by cooling the fume and separating coarse particles, are standard equipment, and the zinc oxide is usually sufficiently white to be saleable.

Solid wastes cause practically no problem in the secondary copper industry. Metal is reclaimed from waste products wherever it is economic to do so, and slags which have too low a copper value for further treatment are granulated, crushed and sold for grit blasting.

### The Secondary Aluminium Industry

It has already been pointed out that in this section of the industry fume arises mainly from the use of fluxes based on sodium chloride employed to reduce melting losses in reclaiming scrap. Small proportions of cryolite are also sometimes included in the flux. These fumes are not dark, nor do they constitute a hazard to health, but they are very noticeable, especially in humid weather, as the fume is extremely hygroscopic and attracts small droplets of water. The requirement is that the stack emission, although it may be visible, should be thin and should disperse rapidly, and the industry has until the end of 1973 to meet this requirement. In practice this involves the use of arrestment plant of high efficiency.

Pollution problems also arise with the reduction of the magnesium contents of melts to the levels permitted in foundry ingot specifications. The removal of magnesium can be effected by the use of fluoride containing fluxes, although this requires a fairly high temperature, or by chlorination when liquid magnesium chloride forms in preference to aluminium chloride. Chlorination

is more common. It can result in the emission of free chlorine and fumes of aluminium chloride, and it thus requires control.

Another source of pollution is painted or lacquered scrap which produces smoke and fume during melting. The varied nature of this scrap makes pretreatment more difficult than is the case with oil contaminated swarf, and dealing with it effectively and economically is still a problem.

The melting equipment used for secondary aluminium alloy production and the refining practice vary considerably. Sampling of the emission was carried out by the B.N.F.M.R.A. some time ago, and representative results are given in Table II for three sites.

Collection of fume from "salt" fluxes has raised interesting problems, mainly on account of the hygroscopic nature of the components and their corrosiveness in the presence of moisture. Despite initial doubts fabric filters have been proved satisfactory, provided that the installation is maintained above the dew point and fabrics having good acid resistance are chosen. An elaborate bag filter installation has been described by Margraf.<sup>7</sup> In this case a forced draught cooler was used to reduce the temperature of waste gas to about 120°C before the fumes entered the filter which was also protected by a fresh air safety valve opened automatically by a motor if the inlet temperature of the fumes reached an excessive value. A polyester needlefelt material bag was used which has the ability to operate up to 200°C and

TABLE II

		Analysis of emissions from rotary furnaces at three works					
		Solid Emission			Gaseous Emission		
		Total g/m <sup>3</sup>			g/m <sup>3</sup>		
Works	Sample	At	%Cl	%F	HCl	HF	Flux Temperature and
A	No.	NTP					Stage of Operation
	1	0.85	30.5	Nil	0.02	Nil	Melting Salt—no metal in
Salt	2	0.30	35.5	Nil	0.007	Nil	furnace.
Only	3	0.73	27.1	Nil	0.014	Nil	Furnace contained Salt—
							36 kg Al.
	4	0.24	5.2	Nil	Nil	Nil	End of melting cycle. Metal
B	1	1.76	21.6	15.7	0.024	0.027	about 850°C.
	2	2.86	62.1	1.0	0.073	0.073	Charging oily turnings.
							Melting new flux—not molten.
Salt	3	0.41	39.3	1.0	not measured		Temp. 980-1000°C. Charging
							Copper.
—	4	0.96	49.5	Nil	not measured		Charging Scrap. Furnace walls
Fluoride	5	3.96	60.6	0.2	0.009	0.014	about 750°C.
	6	0.85	48.8	1.2	Nil	0.002	Temp. 800°C. Full of Aluminium.
	7	1.10	51.2	0.7	0.011	0.042	Casting. Bath temp. 860°C.
	8	0.46	47.2	2.2	Nil	0.011	Furnace stationary.
C	1	0.55	75.0	0.5	0.55	0.014	Temp. 810°C. New flux, charging
Salt	2	2.80	48.4	1.0	0.06	Nil	silicon.
+	3	1.35	47.0	0.4	0.05	Nil	Temp. 875°C. Fluoride added to
Fluoride	4	1.86	43.5	0.5	0.05	0.39	reduce Mg.
	5	0.48	50.6	10.3	0.04	0.12	Temp. 700-750°C. Taken while
	6	2.88	59.7	0.3	0.05	0.02	charging soap.
	7	5.12	62.0	0.5	0.07	Nil	Flux solid throughout sample.
							Temp. 820°C. Flux molten. No
							metal charged.
							Temp. 850°C. Furnace contained
							Al and S.
							Temp. 780°C. Furnace full of
							L.M.2.
							Beginning of slagging operation.
							Flux solid.
							Temp. 870°C. Slagging.
							Temp. 990°C. End of Slagging.

Each of these works was using rotary furnaces. An analysis of the particulate matter in the fume is given in Table III.

TABLE III

Sodium chloride	71.0%
Sodium sulphate	11.0%
Potassium chloride	8.8%
Cryolite	1.4%
Aluminium chloride	1.3%
Calcium fluoride	0.1%
Carbon	3.8%
Metallic oxides	1.8%

The tendency now in larger works is towards reverberatory furnaces with side-wells in which the scrap can be submerged once a molten heel has been established. This system requires much less flux and there is a great reduction in the level of emissions. Unfortunately certain kinds of low grade materials are still best treated in rotary furnaces with copious amounts of flux.

has also the requisite resistance to attack by acid vapours. According to Margraf, the dewpoint of the waste gases was found to vary between 14°C and 30°C so that there was no problem with the pick-up of moisture while the plant was in operation. During shut-down valves automatically closed off the filter chambers preventing ingress of air.

Although it has been suggested that it is necessary to use filters coated with materials to absorb or neutralise acidic products, this in fact does not appear to be necessary.

Wet collection of this salt fume is possible with a high pressure venturi scrubber, and several of these have been tried in the industry. One or two plant manufacturers were so incautious as to supply scrubbers without fully appreciating the nature of the fume and constructed them of stainless steel, which corroded away in a matter of weeks. More success has been achieved with scrubbers coated with acid resistant

materials. It is then necessary first to cool the fume in a simple spray chamber, and a plant of this kind is described by Johansson and Walker.<sup>8</sup> However, for high collection efficiency with the submicron particulate matter a pressure drop of 30 in. water gauge or more is needed, and the conditions are very severe for the coating materials. There is also a high power cost, which tends to militate against the use of high pressure drop scrubbers for application involving fairly continuous operations.

Collection by irrigated electrostatic precipitators has also been demonstrated to be technically feasible.<sup>9</sup> The same constraints regarding the corrosion resistance of the materials of construction apply, and the first stage is that of cooling the fumes by simple water sprays. The second stage has the object of humidifying the gases to obtain optimum conditions for precipitation in the actual electrostatic precipitator. In the past the high capital cost has been a deterrent to the use of electrostatic precipitators, though this is to some extent offset by low running costs. The possibility of cheaper package units might make them worthy of further consideration.

Spent fluxes and drosses from secondary aluminium smelting frequently contain fluorides which may be slowly leached from the material. Disposal of these solid wastes is now under control.

### Secondary Lead Industry

One of the most important sources of secondary lead at the present time is the motor car battery, and these can be hazardous to handle unless proper methods are used. At the moment most of the batteries in this country have vulcanised containers, and since these are undesirable in the smelting furnaces, the containers have first to be broken open and the plates etc. removed. By the time a battery is discarded, it usually contains a sludge of lead oxide, and care has to be taken to remove all of this from the container. It is usual to wash the cases thoroughly to free them from oxide, and as they have no value they are dumped. The lead oxide is, of course, recovered, and the contents of the batteries—plates, separators etc.—are smelted. The increasing use of more modern plastic materials for the construction of batteries could alter the position, since these are usually more completely combustible, holding out the possibility of smelting down complete batteries. Care might be necessary if the use of PVC separators spreads to this country, as decomposition could lead to reactions producing lead chloride, which might be difficult to eliminate from the refining cycle.

Recovering lead scrap does not give rise to large concentrations of fume, but because of the cumulative toxic effects of lead extreme precautions are necessary to deal not only with fume in the stack gases from furnaces but also with all possible adventitious escape of fume. Thus it is not uncommon to have fume extraction hoods over charging doors, launders, ladles and pouring stations to collect the fume from these sources as well as from the stack gases themselves. The TLV laid down by the Factory Inspectorate for lead in the plant is 200  $\mu\text{g}/\text{m}^3$  and efficient fume extraction is necessary to protect the workers, who are in any case subject to regular medical checks.

Fume treatment in lead works involves a level of containment of the fume approaching 100%, and a level of collection of the same high order is necessary to comply with the requirements of the Alkali Inspec-

torate. This applies whether the lead is being recovered in blast furnaces, reverberatory or rotary furnaces. It is most common to see large bag house installations. Because of the large volumes of air introduced into the gas stream from exhaust hoods over charging doors and ancillary equipment, temperature is rarely a problem in collecting the fume. However, it is advisable to protect the bag plant against ingress of moisture during shut-down periods as there are usually sufficient acids present in the exhaust gases to cause rapid corrosion. Maintenance of bag plants is obviously an unpleasant business, but there are clearly attractions in collecting the fume dry. Wet scrubbers of the venturi type are occasionally used and there are also some electrostatic precipitators. Both of these are most suitable where the volume of gas to be treated is not too large.

It has become increasingly apparent that the main environmental problems in the secondary lead industry occur in handling materials within the works area rather than in emissions from stacks and the like, and a great deal of attention is now being given to this. The great care necessary in breaking up scrap batteries has already been emphasized. The oxide can easily become transferred to clothing or otherwise scattered. Dust has to be prevented wherever possible by keeping such things as drosses damp, or else extracting dust to recovery plants. Most lead works make considerable use of air samplers to check for sources of contamination in and around the plant, and the portable "Fume Sniffer" developed by the B.N.F.M.R.A. has also proved of value in giving a rapid check for potentially dangerous concentrations of dust and fume.<sup>10</sup>

The contamination of clothing is a problem, since lead compounds in the form of fine dust can easily be spread outside the works from this source. The dust seems to adhere to cloth quite tenaciously and in tests carried out by the B.N.F.M.R.A. it has been shown that significant amounts of lead bearing dust can be shaken from contaminated overalls even after these have been laundered. Shaking freshly laundered cotton twill overalls gave rise to instantaneous values of lead in the atmosphere peaking up to 1000  $\mu\text{g}/\text{m}^3$ . One does not wish to exaggerate the problem, but for complete safety it may be advisable to have protective clothing, boots etc., removed in one zone and outdoor clothing put on elsewhere. There is also the possibility of lead bearing dusts being spread by vehicles leaving works. Responsible lead smelters now insist on loads being protected by covers, and precautions are taken to keep roadways within the works area free of dust which might otherwise be carried out on vehicle tyres.

The disposal of solid wastes from the lead industry is not so much a problem. There are waste slags and those of the silicate type are virtually inert. Slags or drosses resulting from soda ash treatments contain soluble lead compounds, and these require more care over disposal.

### Treatment of Zinc Residues

The zinc industry differs from those discussed above in that practically no scrap zinc is recycled as metal. However, scrap metal, and more especially zinc bearing residues, are a source of zinc dust and of zinc oxide. In the former case, the materials are simply distilled into a closed chamber, and in the latter case strongly oxidising conditions are used deliberately to produce zinc oxide which is collected in a bag house. There appear to be no serious emission problems.

### Future Trends

The advances that have been made in controlling emissions have been at considerable cost. Maintenance of arrestment plant is a continuing burden on industry. It is not surprising, therefore, that increasing attention is being given to alternative processes which avoid pollution at source. For example, processes have been developed in the secondary aluminium industry for avoiding or considerably reducing the emissions from chlorination treatments to remove magnesium. One such is the Derham process<sup>11</sup> which claims to avoid significant emissions by controlling the amount of chlorine used and by covering the molten metal during treatment with a deep flux layer of mixed alkali metal fluorides or chlorides sufficient to absorb the major part of any aluminium chloride formed. The magnesium chloride is also absorbed into this flux layer. There is also an Alcoa fumeless "demagging" process which is carried out in line between a holding furnace and a casting machine.

Stoichiometric reaction between chlorine and magnesium is effected within a closed rectangular vessel divided into compartments in order to effect a large interfacial contact area between molten metal and gas. The magnesium chloride which is formed is removed by a vacuum tapping vessel and is saleable. It is claimed that there is virtually no emission. The copper industry is also giving attention to in-line refining treatments for the removal of elements such as tin and lead as well as

some of the more readily oxidisable impurities. Such in line processes considerably reduce the volumes of emissions that need to be handled at any one time in comparison with batch refining processes. There are also developments in water based cutting fluids as replacements for mineral oils and soluble oils. These again could tremendously reduce the emission problems of remelting swarf and borings if they gained wide acceptance.

The emphasis on pollution control is, in fact, a considerable spur to the investigation of alternative processes which frequently emerge as more efficient than traditional practices. It would be a tragedy if extreme demands on industry for immediate measures to cut pollution so reduced the supply of capital that industry was not encouraged to develop and exploit such advances.

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- <sup>9</sup> N. E. Rich, *ibid.*, pp. 75-84.
- <sup>10</sup> R. A. White, J. of Scientific Instruments, 1967, **44**, 678.
- <sup>11</sup> British Patent 1252741.

## Clean Air Begins at Home

Inserted in this issue of "Clean Air" is a copy of the new pamphlet prepared by the Society "Clean Air Begins at Home".

This pamphlet has been prepared, printed and published by the Society in response to many requests. It has been found to be particularly useful for local authorities planning new smoke control areas. Further copies may be obtained from the headquarters of the Society. The cost is £5.00 per thousand copies excluding carriage and postage.



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# National Society for Clean Air

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### **SOUTH WALES and MONMOUTHSHIRE**

L. Morgan, 9 Lodge Drive, Baglan, Port Talbot (5231)

The parent of the Society was the Coal Smoke Abatement Society, established in London in 1899. It did valuable pioneering work and accomplished the first necessary stage of making it understood that clean air was not the pet notion of a few cranks. It co-operated with a provincial association that had been formed in 1909—the Smoke Abatement League of Great Britain. These two bodies amalgamated in 1929 to form the National Smoke Abatement Society. This name was retained until 1958, when it was changed to the present one.

From a handful of individuals the Society's membership has grown to include not only considerable private membership both at home and abroad, but membership of local authorities, corporate bodies, (representing the Learned Societies and Institutions),

the fuel industries and those industries concerned with the production of appliances and equipment connected with clean air.

The Society is a voluntary body and receives no official grant, and therefore essentially subsists on the subscriptions of its members. The general policy of the Society is Directed by the Executive Council and its Committees. There are twelve Divisional Councils of members, with their own committees and honorary officers.

The Society's objects are, in brief, to promote and create by publicity and education an informed public opinion on the value and importance of clean air and to initiate, promote and encourage the investigation and research into all forms of atmospheric pollution in order to achieve its reduction or prevention.

## Membership of the Society and Subscriptions

Membership of the Society is open to any individual, corporate body or local authority. Subscription rates are given below.

### **Individual Members**

Not less than £3. Subscriptions can be paid by Covenant, minimum of seven years at £1.83, the balance being recoverable from the Inland Revenue by the Society. Those Members wishing to pay their subscription by Bankers order or wish to Covenant with the Society are requested to apply for the necessary forms for completion.

### **Local Authority Members**

Population	£	
Less than 25 000	10	appointing 2 representatives
25 001 to 50 000	13	appointing 2 representatives
50 001 to 75 000	17	appointing 2 representatives
75 001 to 100 000	23	appointing 3 representatives
100 001 to 175 000	35	appointing 3 representatives

175 001 to 250 000	40	appointing 4 representatives
250 001 to 375 000	45	appointing 4 representatives
375 001 to 500 000	50	appointing 5 representatives
Over 500 000, £15 and 1 additional representative for each additional 1 000 000 of population or part thereof.		

### **Corporate Members**

Not less than £40 (appointing 4 representatives and 2 delegates in each appropriate division) or not less than £23 (appointing 2 representatives and 1 delegate in each appropriate division)

### **Associate Members**

Not less than £3

*Note:* The Society's subscription year commences 1st April.

National Society For Clean Air

# NEWS FROM THE DIVISIONS

## YORKSHIRE

An open meeting of the Yorkshire Division was held on Wednesday, 24th January at Mansion House, High Street, Doncaster. The meeting was attended by 65 members of the Division who enthusiastically received a paper by Mr. G. O. Allen, F.A.P.H.I., M.Inst. P.C., Chief Public Health Inspector and Environmental Health Officer to the Borough of Scunthorpe. His paper was entitled "Sixteen Years—A saga of Smoke Control" and is reproduced elsewhere in this journal.

A Civic welcome was given to the delegates by Miss E. Plumb, the Mayor of Doncaster, who honoured the members by attending the meeting and giving an address. Hospitality was given at the close of the meeting by kind courtesy of the Doncaster Corporation.

*J. H. Wyatt  
Hon. Secretary*

## NORTH WEST

The members of the North West Division of the National Society for Clean Air were invited to visit and inspect the factory of Messrs. Bellings Limited of Burnley Lancashire on Wednesday, 4th April, 1973.

Mr. Davies, Regional Director of Bellings Limited, welcomed all members attending on behalf of his company and Mr. Brunton, Development Director, who unfortunately could not be present.

He explained to the members that his Company were to have a trade show later in the month and they would be privileged to have a preview of it. He explained that the theme of the show was to be a European one and the Company were investigating what fields were open to them. He explained that the Italian trade demanded "with it" designs while the Germans liked "period" designs but at the same time the Company must look after the home market.

The Company was formed in 1905 by Mr. C. R. Belling and some of his early designs of heating appliances were on show in the exhibition. Mr. Belling made the first appliance himself and delivered them by means of a bicycle, the Company now produce 6,000 appliances per week but the maximum number could be in the region of 20,000 per week.

Mr. Davies explained that the Company had a 25 per cent share in National Direct Heating Market, a 30 per cent share of cooker sales (large cookers), 81 per cent of the small cooker market and a total turnover of £16,250,000.

Mr. Davies spoke of the development of the Company and the production of timber surrounds, he also spoke

of his Company's contribution to improving the environment particularly in the field of clean air and made reference to the new Studio Fire which had pushed the panel fire out of favour and was an assured success. He offered Local Authorities cheap facilities for this fire and hoped they would avail themselves of the offer.

Members of the Division were entertained to luncheon by the Company and after lunch a tour of the factory was made under the guidance and instruction of the Sales Staff of Messrs. Bellings. The construction of heating appliances of all kinds was seen in all its stages of production and all members who attended expressed their appreciation of the very instructive and interesting visit.

*W. E. Pollit  
Hon. Secretary*

## EAST MIDLANDS

A meeting of the East Midlands Division was held at the Council Chamber, Southwell R.D.C. Offices on Thursday, 8th March. Members were welcomed on behalf of the Southwell R.D.C. by the Chairman of the Council, Councillor W. H. Stevens.

Following the business the meeting was addressed by Dr. R. V. Riley, Ph.D., B.Sc., F.I.M., F.I.B.F., a co-opted member of the Divisional Council who is Divisional Water and Clean Air Co-ordinator for the Tubes Division of the British Steel Corporation at Corby. Dr. Riley spoke on the subject "On Being Good Neighbours; Environmental Considerations in Steel Making".

Dr. Riley indicated how the use of solid fuel had declined in the last twenty years in favour of oil, natural gas and electricity. Details were given of the various steps in the steel making process and the points at which pollution is likely to arise. These were taken in turn and the ways in which emissions are being controlled were described. Particular reference was made to the modern 300 ton capacity BOS converters which use massive quantities of oxygen and, because of the very high temperatures give rise to copious clouds of the reddish-brown iron oxide fumes which result from vaporisation of the metal. Slides were used to illustrate the talk and successive pictures showed the brown fumes before and after the fitting of arrestment plant.

Restoration of amenity after excavating for home ores was also described. Massive strippers remove soil layers to a depth of 80ft. in the extraction of the ores. As the ore is removed the areas are made good and returned to former use. In this way also the steel industry tries to be a good neighbour in maintaining the environment.

Dr. Riley described the various ways which may now be adopted for fume removal from electric arc furnaces, a process which is complicated in that the size of modern furnaces requires top loading so that the roof of the furnace has to be removable. This means that provision must be made for extraction from the shop as well as from the furnace.

Vast quantities of water are also used in the industry and the treatment of effluent costs large sums of money. It is nevertheless part of the policy of the steel industry to ensure that rivers are not polluted by the discharges. In this respect it is necessary to satisfy the River Authority in the same way as the Alkali Inspectorate require limits on emissions to atmosphere.

Dr. Riley touched briefly on the foundry iron melting processes, especially the Cupola furnace and mentioned some new developments which were taking place in dealing with the discharges from them.

Finally the new organizational structure recently instituted by the British Steel Corporation for the monitoring and rectification of unsatisfactory situations within the industry were described.

Mr. G. Waterworth, Chief Public Health Inspector of Corby thanked Dr. Riley, on behalf of the members present, for his excellent paper.

The Chairman, Mr. H. B. Dunstan, in adjourning the meeting for lunch expressed thanks to the Chairman and Members of the Southwell R.D.C. for acting as hosts to the Division and also paid tribute to the excellent arrangements made by Mr. J. H. Marshall, the Chief Public Health Inspector and his Deputy, Mr. B. Cast.

After an enjoyable lunch at the Crown Hotel members moved on to the Kirton Brickworks of the Butterly and Blaby Brick Company where a visit had been arranged by kind permission of the Managing Director, Mr. I. Penfold.

Members were shown all the various processes from the preparation and moulding of the clay, through the various phases of heating, firing and cooling in the gas fired kilns to the assembly and despatch of the final product.

For anyone with experience of brickworks using coal firing this visit was in striking contrast to what would have been seen only a few years ago at many such works. The only visible emission was steam, and there is no doubt that here is a real contribution to clean air.

After the tour of the works light refreshment was kindly provided by the Company. In the absence of the Chairman who had been unable to stay for the afternoon because of another engagement the Deputy Chairman, Alderman A. Lister Robinson, thanked Mr. Penfold for affording us the opportunity to visit the works and said that he felt they were an example for other brickworks to follow.

The Division is sad to report that Mr. R. Davies, the Chief Public Health Inspector of Derby, unfortunately passed away in March, 1973.

*E. F. Raven  
Hon. Secretary*

## CLEAN AIR SPRING SEMINAR

Oxford 3rd-4th April 1973

The second Clean Air Spring Seminar was held at the Assembly Room, The Town Hall, St. Aldate's, Oxford on the 3rd and 4th April 1973. The seminar was opened by the Lord Mayor of Oxford, Alderman A. B. Conners, at 9.15 a.m. on Tuesday, 3rd April. The opening ceremony at which the President of the Society, Mr. Stanley E. Cohen, C.B.E., took the Chair got the seminar off to a good start and the first paper by Mr. C. L. Goodacre, consultant engineer, on "Lead in Petrol—Is It Necessary?" was presented at 9.30 a.m. This was a provoking paper and a lively discussion followed. After a break for coffee, the second part of the first session was taken up by a panel ready to answer questions on "Acceptable Devices for the Control of Emissions". On this panel were Mr. J. H. Alden of Vauxhall Motors, Dr. J. H. Weaving of British Leyland Limited, Mr. George Donald of the Vehicle Engineering Division of the Department of the Environment, Charles Goodacre and Dr. J. Ellison of the Medical Research Council Air Pollution Unit. Unfortunately the discussion from the previous paper on "Lead in Petrol" tended to spill over into this question and answer period and there was not

as much time as originally planned for the answering of more general questions. Nevertheless, the discussion served to show that there are some very opposed views about the retention of lead in petrol.

The Tuesday afternoon session was concerned with diesel engines; under the Chairmanship of Dr. S. R. Craxford, Mr. N. M. F. Vulliamy, Assistant Director of Engineering of Perkins Engines Company, presented a paper on "Why Do Diesels Make Smoke—How May It Be Abated?". This was followed by a paper by Mr. Philip Draper on "Regulations Regarding Smoke Emission: Are They Adequate? How Can They Be Strengthened?". This proved to be an extremely useful session at which there was a very balanced discussion.

The Wednesday morning dealt with gas turbines and jet engines. Mr. R. A. W. Hollingdale of the North West Division was in the Chair and Mr. M. R. Williams, the Chief Combustion and Systems Engineer, Rolls Royce (1971) Ltd., Bristol Engine Division, presented his paper on "Control of Pollution in Jet Engines" in

which he outlined some of the problems encountered by the engineer designing jet engines for the future. Mr. M. A. Stokes, the Market Manager, Traction, Rolls Royce (1971) Ltd., Industrial and Marine Division followed with a paper on "Gas Turbines for Rail Traction". This was a glimpse of the problems of the future when in certain instances gas turbines might be used in place of diesel propulsion on certain railway systems.

The final session on the Thursday afternoon under the Chairmanship of Mr. W. Combey was a more general look at the future by Dr. C. G. Williams of Ricardo and Company Engineers (1927) Limited when he presented a paper on "The Future: Alternative Power Plants for the Motor Car—or Alternative Fuels". This very far ranging paper provoked a great deal of

discussion but left one with little doubt that the motor car as we know it was going to be with us for some considerable time to come.

This seminar was different from the previous one in that it was residential and delegates were accommodated very comfortably at St. Hilda's College, Oxford where all meals were taken.

The seminar was attended by some 110 delegates. All sessions were full and discussion was lively. The interest shown seems to indicate that there is a definite requirement for technical seminars of this nature. In view of this, the Council of the Society have approved the recommendation of the Conference Committee that a seminar should be held next March in Sheffield.

# 10%

**The National Society for Clean Air is pleased  
to announce that a discount of 10% is available  
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who have paid their current year's subscription*

# SMOKE CONTROL AREAS

## Progress Report

Position at 31st March 1973

(Figures supplied by the Department of the Environment)

	England			Wales			Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 31.12.72</b>	3,895			8			225			49		
Acres .. .. .		1,155,682			1,097			118,645			11,587	
Premises .. .. .			5,480,128			4,979			532,111			25,910
<b>Smoke Control Orders Confirmed(31.12.72-31.3.73)</b>	123			3			3			4		
Acres .. .. .		44,698			483			925			1,949	
Premises .. .. .			169,653			29			1,204			4,276
<b>Totals .. .. .</b>	<b>4,018</b>	<b>1,200,380</b>	<b>5,649,781</b>	<b>11</b>	<b>1,580</b>	<b>5,008</b>	<b>228</b>	<b>119,570</b>	<b>533,315</b>	<b>53</b>	<b>13,081</b>	<b>30,186</b>
<b>Smoke Control Orders Submitted .. .. .</b>	126			2			3			2		
Acres .. .. .		63,429			371			1,374			906	
Premises .. .. .			189,190			1,844			4,888			2,770
<b>Grand Totals .. .. .</b>	<b>4,144</b>	<b>1,263,809</b>	<b>5,838,971</b>	<b>13</b>	<b>1,951</b>	<b>6,852</b>	<b>231</b>	<b>120,944</b>	<b>538,203</b>	<b>55</b>	<b>13,987</b>	<b>32,956</b>
<b>Smokeless Zones (Local Acts) in operation.. ..</b>	44			—			—			—		
Acres .. .. .		3,400			—			—			—	
Premises .. .. .			41,060			—			—			—

## SMOKE CONTROL POSITION IN REGIONS OF ENGLAND

at 31st March 1973

(Figures supplied by the Department of the Environment)

(1) Region	(2) No. of black area acres covered by smoke control and smokeless zones orders confirmed or awaiting decision	(3) Percentage* of total black area acreage in region covered	(4) No. of black area premises covered by smoke control and smokeless zones orders confirmed or awaiting decision	(5) Percentage* of total black area premises in the region
Northern .. .. .	59,067	47.1	242,062	43.8
Yorks & Humberside .. .. .	242,148	64.3	804,678	68.9
East Midlands .. .. .	85,792	32.0	260,784	50.9
Greater London .. .. .	289,117	88.4	2,414,514	91.5
North West .. .. .	238,302	59.4	1,000,599	58.8
West Midlands .. .. .	104,514	42.0	476,387	45.3
South West .. .. .	11,231	42.6	41,278	27.7
<b>Total (black areas) .. .. .</b>	<b>1,030,171</b>	<b>58.1</b>	<b>5,240,302</b>	<b>67.4</b>
<b>Outside black areas .. .. .</b>	<b>233,638</b>		<b>598,669</b>	
<b>Grand Totals .. .. .</b>	<b>1,263,809</b>		<b>5,838,971</b>	

\* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (eg: there may be some areas of open country).

# New Smoke Control Orders

*The lists below are supplementary to the information in the last issue of Clean Air (Spring 1973) which gave the position up to 31 December 1972. They now show changes and additions up to 31 March 1973.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.*

## NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

### Northern

Gateshead C.B. (No. 15), Jarrow B.C. (Nos. 9 and 10), Teesside C.B. ("F", "G" and Nos. 12 and 13), Tynemouth C.B. (No. 14), Darlington C.B. (No. 9), Gosforth U.D. (No. 4), Wallsend B.C. (No. 7), Hartlepool C.B. (No. 24), South Shields C.B. (Nos. 11-18), Sunderland C.B. (Nos. 9, 10 and 11).

### Yorkshire and Humberside

Huddersfield C.B. (Bradley Plain), Wakefield C.B. (St. John's No. 2 and Sandal No. 4), Barnsley C.B. (Nos. 16 and 17), Morley B.C. (No. 43), Pudsey B.C. (Nos. 12 and 13), Sowerby Bridge U.D. (Nos. 11 and 12), Stanley U.D. (South Stanley No. 3), Horsforth U.D. (Nos. 34 and 35), Kingston upon Hull C.B. (No. 13), Pontefract B.C. (No. 9), Wath-upon-Dearne U.D. (Nos. 6 and 7).

### North West

Accrington B.C. (No. 12), Ashton-under-Lyne B.C. (No. 15), Blackburn C.B. (No. 13), Darwen B.C. (No. 12), Hyde B.C. (No. 9), Manchester C.B. (Moston), Middleton B.C. (No. 18), Stalybridge B.C. (Brushes Estate and Huddersfield Road/Copley Estate), Stockport C.B. (Heaton Moor/Heaton Norris), Wallasey C.B. (No. 17), Westhoughton U.D. (No. 8), Wigan C.B. (Nos. 9 and 10), Birkenhead C.B. (No. 16), Little Lever U.D. (No. 3), Preston C.B. (Nos. 26, 27 and 28), Prestwich B.C. (No. 10A), Rochdale C.B. (Mayfield & Halifax Road), Colne B.C. (No. 10), Eccles B.C. (No. 18), Failsworth U.D. (No. 11), Fulwood U.D. (No. 4), Irlam U.D. (No. 6), Runcorn U.D. (No. 9), Urmston U.D. (No. 12).

### West Midlands

West Bromwich C.B. (Nos. 24 and 25), Sutton Coldfield B.C. (No. 26).

### East Midlands

Carlton U.D. (No. 11), Beeston and Stapleford U.D. (No. 14), Ilkeston B.C. (No. 8).

### South West

Bristol C.B. (No. 9).

### Greater London

Barnet L.B. (Nos. 14 and 15), Brent L.B. (Nos. 12 and 13), Hillingdon L.B. (Nos. 18, 19 and 20), Merton L.B. (Nos. 24 and 25), Newham L.B. (Nos. 9 and 10), Waltham Forest L.B. (No. 17), Harrow L.B. (No. 13A), Wandsworth L.B. (No. 6), Havering L.B. (No. 7), Sutton L.B. (No. 27), Kingston-upon-Thames L.B. (No. 22).

### Outside the Black Areas

Consett U.D. (No. 1), Easington R.D. (Peterlee No. 3), Harrogate B.C. (No. 2), Hemel Hempstead B.C. (Adeyfield No. 2 and Town Centre), Leyland U.D. (No. 1), Lincoln C.B. (Nos. 5 and 6), Stocksbridge U.D. (No. 2), Thurrock U.D. (No. 9), Cheshunt U.D. (No. 8), Darlington R.D. (Newton Aycliffe No. 6), Doncaster R.D. (No. 2), Royal Leamington Spa B.C. (No. 13), Luton C.B. (Nos. 10 and 11), Oxford C.B. (No. 12), Saltburn and Marske by-the-Sea U.D. (No. 5), Southwell R.D. (No. 2), Whiston R.D. (Central Area), Whitley Bay B.C. (No. 10), Bletchley U.D. (No. 2), Chesterfield R.D. (No. 20), Exeter C.B. (Beacon Heath), Glossop B.C. (No. 6), High Wycombe B.C. (No. 19), Longdendale U.D. (No. 1), Ripley U.D. (No. 3), Seaton Valley U.D. (No. 2), Skelmersdale and Holland U.D. (No. 8), Stevenage U.D. (No. 1), Warrington R.D. (No. 9), Wellington (Salop) U.D. (No. 2).

## NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

### Northern

Hebburn U.D. (No. 15), Teesside C.B. (No. 11, 14 and 15), Tynemouth C.B. (Nos. 15, 16 and 17), Whickham U.D. (Nos. 12 and 13), Blaydon U.D. (No. 5), Newburn U.D. (Nos. 16-19), Gosforth U.D. (No. 5).

### Yorkshire and Humberside

Conisbrough U.D. (Nos. 2, 3 and 4), Barnsley C.B. (No. 15), Leeds C.B. (Nos. 111, 112 and 113), Horsforth U.D. (No. 33), Darton U.D. (Nos. 24, 25 and 26), Stanley U.D. (Lintz No. 2 and Burnopfield No. 1), Halifax C.B. (No. 19), Batley B.C. (No. 8), Wakefield C.B. (Denby Dale Road No. 1; Lupset No. 1 and Thornes Lane No.

2), Rawmarsh U.D. (Nos. 1 and 2), Rotherham C.B. (Wellgate), Heckmondwike U.D. (No. 10), Mirfield U.D. (No. 13), Hoyland Nether U.D. (No. 3).

### North West

Birkenhead C.B. (Nos. 9 (Thingwall), 11, 15, 18 and 27), Farnworth B.C. (Nos. 7 and 8), Leicester C.B. (Nos. 31, 32 and 33), Kearsley U.D. (No. 6), Ashton-in-Makerfield U.D. (No. 1), Barrowford U.D. (No. 6), Litherland U.D. (No. 3), Middleton B.C. (No. 20), Accrington B.C. (No. 13), Huyton-with-Roby U.D. (No. 9), Worsley U.D. (No. 13), Oldham C.B. (No. 20), Manchester C.B. (Crumpsall), Oswaldtwistle U.D. (No. 5), Darwen B.C. (No. 13), Tyldesley U.D. (No. 5), Brierfield U.D. (No. 7).

### East Midlands

Alfreton U.D. (No. 7), Chesterfield B.C. (No. 7), Nottingham C.B. (No. 6), Arnold U.D. (No. 5A), West Bridgford U.D. (No. 2), Kirkby-in-Ashfield U.D. (Nos. 7 and 8), Derby C.B. (Nos. 25-28), Sutton-in-Ashfield U.D. (No. 1, 1973), Dronfield U.D. (No. 8).

### West Midlands

Sutton Coldfield B.C. (Nos. 24 and 27), Bedworth U.D. (No. 5), Wolverhampton C.B. (No. 18), Walsall C.B. (No. 16), Birmingham C.B. (No. 161), Nuneaton B.C. (No. 7).

### South West

Bristol C.B. (No. 11).

### Greater London

Lambeth L.B. (No. 29), Sutton L.B. (No. 26), Croydon L.B. (No. 15), Brent L.B. (Nos. 8 and 10), Merton L.B. (No. 26), Hillingdon L.B. (Nos. 21 and 22), Waltham Forest L.B. (No. 18), Barking L.B. (No. 12), Bexley L.B. (No. 13).

### Outside the Black Areas

Cambridge B.C. (No. 3), Runcorn R.D. (No. 7), Skipton R.D. (Sutton No. 2), Hazel Grove and Bramhall U.D. (Nos. 8 and 9), Belper R.D. (No. 4), Hemsworth R.D. (South Kirkby No. 1), Blackburn R.D. (No. 3), Potters Bar U.D. (No. 5), Saltburn and Marske by-the-Sea U.D. (No. 4), Slough B.C. (No. 15), Guildford B.C. (No. 1), Colne Valley U.D. (No. 2), Marple U.D. (No. 6), Burnley R.D. (No. 2), Thurrock U.D. (No. 10), Royal Leamington Spa B.C. (No. 14), Reading C.B. (No. 19), Southport C.B. (Nos. 2 and 3), Aylesbury B.C. (No. 3), Preston R.D. (Penwortham No. 1), Lichfield C.B. (Nos. 1 and 2), Seisdon R.D. (No. 3), Northampton C.B. (Nos. 9 and 10), Bentley with Arksey U.D. (Nos. 4 and 5), Whiston R.D. (Halewood No. 2).

## WALES

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET IN  
OPERATION**

Wrexham B.C. (Nos. 5-7).

**NEW SMOKE CONTROL ORDERS  
SUBMITTED BUT NOT YET  
CONFIRMED**

Wrexham B.C. (Nos. 8 and 9).

## SCOTLAND

**NEW SMOKE CONTROL ORDERS  
IN OPERATION**

Dumfries B. (Nunwood/Hardthorn), Milngavie (No. 2), Renfrew B. (No. 7).

**NEW SMOKE CONTROL ORDERS  
SUBMITTED BUT NOT  
CONFIRMED**

Stirling County (Laurieston), Airdrie Burgh (Thrashbush), Cumbernauld Burgh (No. 1).

**NORTHERN IRELAND  
NEW SMOKE CONTROL ORDERS  
IN OPERATION**

Ballymena B.C. (No. 3).

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET IN  
OPERATION**

Castlereagh R.D.C. (No. 7), Lurgan B.C. (No. 5).

**NEW SMOKE CONTROL ORDERS  
SUBMITTED BUT NOT YET  
CONFIRMED**

Belfast C.B.C. (No. 11).

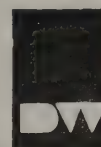
## AIR POLLUTION ABSTRACTS

**1286 An Engineering Approach to the Reduction of Atmospheric Pollution from Combustion Processes.** Cosby, W. T. (J. Instit. of Fuel, April, 1973). The engineer's problems and successes in relation to the national progress towards clean air are discussed, with particular reference to the reduction of atmospheric pollution from processes involving combustion. Some examples are given in which a change to cleaner fuels has removed the problem. Other instances are cited in which the presence of solid and/or liquid particulate matter in the flue gases has currently to be accepted as endemic to the process. The widely varying nature of typical emissions is examined, together with the factors which determine the selection of gas cleaning equipment for their control and removal. The problem of the discharge of SO<sub>2</sub> from combustion processes is also put in some perspective. Brief reference is made to the relevant legislation governing standards of emission and an assessment made of the national reduction in atmospheric pollution achieved by the application of these standards over the past 15 years. Attention is drawn to the dramatic reduction in atmospheric pollution which could be quickly realised by a more positive approach to the correct operation of existing gas cleaning plant.

**1287 The Interpretation of "Best Practicable Means".** Tunnicliffe, M. F. (Chem. Engineer, March, 1973). There are frequently incorrect ideas as to the correct interpretation of "best practicable means". This paper puts forward the views of the Alkali Inspectorate and indicates how the Inspectors go about their task of seeking compliance with the Act.

**1288 The Need for Frequency Analysis in the Identification and Solution of Noise Problems.** Phelps, A. H. (J. Air Poll. Control Assoc. 23(1) Jan. 1973). An attempt to characterise a noise problem is sometimes made using a single decibel level reading. Slightly more sophistication is used in attempting to define a noise problem by using an A-scale decibel level. Both simplified approaches are subject to error in overlooking the major importance of decibel levels in each frequency band, particularly when there are pure tone components present. Annoyance is very strongly dependent on energy content in each frequency band. Noise control techniques are equally dependent on the energy level in each frequency band. Identification of pure tone components, when present, is an extremely useful diagnostic tool for finding and quieting the source. Proposed noise criteria for neighbourhoods which reflect the effect of frequency are discussed along with one noise regulation in force that avoids the problem of a single decibel level specification. Some case histories are presented and compared with the criteria.

**1289 Waste Disposal—A General Review.** Skitt, J. (Chem. Engineer, Feb. 1973). A general review of the waste problem, which discusses broadly the composition of refuse and other wastes which arise from modern society. Reference is made to trends, forms of treatment, handling, disposal and research. Comments on the future of waste management include the recommendations of informed bodies contained in recent Department of the Environment reports and some intentions of the Secretary of State as expressed in certain Department of the Environment circulars.



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## Abstracts of Papers presented to the Clean Air Spring Seminar, Oxford, April, 1973

**1290 Lead in Petrol—is it Necessary?** Goodacre, C. L. The author reviews the case for and against lead in petrol and sums up by saying the case against lead in petrol seems a pretty thin one and that the EEC Governments would be well advised to review their unfortunate policy against the use of reasonable lead levels to 0.64 gms. by litre in petrol for any refinery averaging this over the year's production. He suggests that the petroleum and lead alkyl industries would be well advised to move with the times and take T.E.L. off the market as soon as possible and that the petroleum industry might update its Petrol Test Methods, with advantage to all parties, as they may be giving away quality they do not need for the markets.

**1291 Why do Diesels Make Smoke—How May it be Abated?** Vulliamy, N. M. F. The author explains the diesel combustion cycle; the formation of smoke and the nature of smoke and its measurement. Factors

influencing the smoke quantity are given and ways of meeting legislation. Servicing and maintenance of diesel engines is explained and future trends in eliminating smoke examined. Thirteen diagrams are included.

**1292 Regulations Regarding Smoke Emission: Are They Adequate? How Can They Be Strengthened?** Draper, P. Regulations regarding smoke emissions are examined and the anomalies and dilemmas that arise are discussed. The author sums up by saying that it is very beneficial that legislation is coming into effect this year to make it an offence to market diesel road vehicle engines which make more than a light visible smoke when new but it is very evident that the Regulations will have to be tightened up sooner or later to provide that engines are "Rated" at maximum power outputs providing an acceptable margin below the "overload" output at which visible smoke occurs.

**1293 Control of Pollution in Jet Engines.** Williams, M. R. The author discusses present and future control measures.

**1294 Gas Turbines for Rail Traction.** Stokes, M. A. Brief descriptions are given of a number of gas turbine powered or gas turbine boosted trains already in service in order to show some ways in which the gas turbine may be applied. Gas turbine types are then explained and future possibilities examined.

**1295 The Future: The Alternative to the Motor Car—Or Alternative Fuels.** Williams, C. G. The paper discusses alternatives to the motor car and alternative fuels but the author concludes by saying that he does not see any alternative to the internal combustion engine sweeping the board in the foreseeable future. The author expresses the opinion that Britain should not slavishly copy American legislation although this should not stop us from making improvements to the I.C. engine where they are necessary. He also mentions new approaches to the problem which the motor car imposes on the city, such as discouragements for the car to enter the city and improved or even free public transport. Seventeen diagrams are included.

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## Clean Air Spring Seminar 1973

The 1974 Spring Seminar will be held at the Hallam Tower Hotel, Sheffield, on the 26th, 27th and 28th March, 1974.

As well as recounting the City of Sheffield's success in the abatement of air pollution, the seminar will consider and discuss the problems encountered and overcome by the steel and other industries in this field. The afternoons of Tuesday 26th March and Wednesday 27th

March will be devoted to visits to steel works and other industrial plant where delegates will be able to see for themselves the processes undertaken and the problems to be overcome. Specific papers presented at the seminar will discuss these processes and the means employed to abate pollution.

On the Tuesday evening the Lord Mayor and Corporation of Sheffield will entertain the delegates at a Civic Dinner at the Town Hall.

# BOOK REVIEWS

## Understanding and Controlling Air Pollution

Howard E. Hesketh. Copyright 1972 by Ann Arbor Publishers Inc., U.S.A. 411 pages; 107 figures; 40 tables. Price £7.75.

This book is designed to lead the reader to use his own brain in studying to understand and control air pollution, so each of its 13 chapters ends with "Questions for discussion" and "Problems". The author, who is associate professor of Engineering Air Pollution Control, Southern Illinois University, Carbondale, Illinois, U.S.A., has listed no less than 106 references. These are almost all to American work. As the book is clearly intended for use by serious students of air pollution in American colleges this is perhaps barely adequate.

The print appears, at first glance, to be somewhat faint and difficult to read: not so contrasting as old style printers' lettering. But careful study of the photocopied typewriting style of text discovered many excellent features. The convenient sized volume is bound in stiff covers: its matte white paper sheets quite free from those dazzle light reflections that make reading glossy sheets tiring.

After his introductory Table of Contents the author has helpfully included five pages of Table of most commonly used Symbols; and a page of Greek Letters used in his calculations.

Before the Subject Index, at the end of the book, his Appendix A. lists alphabetically Definitions of Terms used in Air Pollution Control: nine pages of them.

Appendix B, Sources of Air Pollution Assistance, will help Americans but be little used by Europeans who have other sources. Appendix C., Conversion Factors, will help many real students.

The first part of the book deals with *General Considerations* in six chapters: Air Pollution and Society; Sources and Emissions; Pollution Transport by the Atmosphere; Air Pollution Chemistry; Effects; and Automotive Pollution.

The second part of the book is longer in covering *Engineering Control* with seven chapters: Classification of Pollutants; Combustion and related Pollutants Disposal; Particulate Collection Theory; Gaseous Pollutant Removal Theory; Control Equipment; Costs of Air Pollution Control; and Sampling and Analysis.

All this makes Hesketh's book an excellently thought out basis for a course of lectures in colleges and universities: so long as the lecturers in this country add reference to the British Clean Air Acts, Alkali Inspectorate, Warren Spring Laboratory, and the Clean Air Year Book 1973.

Many people need an understanding of air pollution: for them and especially for those concentrating on air pollution control this book is well worth buying.

T. Henry Turner

Reader Enquiry Service No. 7333

## Air Pollution (2nd edn.)

W. L. Faith and A. A. Atkinson Jr. pp 393. Wiley-Interscience, New York, London, Toronto, Sydney, 1972.

The first edition, 1959, had the title Air Pollution Control. Dr. Faith was formerly professor of chemical engineering, Kansas, and then Chief Engineer and Managing Director of the Air Pollution Foundation, and President of the Air Pollution Control Association. He is now a consultant. Professor Atkinson occupies the chair of Urban Health and Administrative Sciences, Texas. He has been an Assistant Chief Deputy Air Pollution Control Officer for Los Angeles County.

The preface states that this work should serve as a text book for University air pollution courses as well as to inform technologists, planners, legislators and administrators. Yet in the three long and muddling chapters on the social origins of pollution and on the present stage of development of U.S. Federal, State and local law on air pollution there is no comparison with the much more advanced and well documented methods of control in Great Britain, nor with European, Russian and Japanese standards. The World Health Organization (WHO) is not mentioned except in one U.S. reference. A few of the literature references are to British publications (including this journal) but there are none to European studies.

The description given of the Air Quality Act of 1967 and of the U.S. Clean Air Acts of 1963 and 1970 (31 Dec.) indicate the immense difficulties of Federal control over the 3 million sq. miles and 50 States of the Union. Present Federal regulations (equivalent to British Statutory Instruments and Alkali Inspectors' presumptive limits) are far from comprehensive. They are formulated by the Administrator of the Federal Environmental Protection Agency; he reports directly to the Executive Office of the President. The regulations are classified as (1) *Air Quality Criteria*: these prescribe ambient pollution levels that cannot be legally exceeded during specific time periods in a stated geographic area. So-called primary standards are to protect human health, e.g. concentrations of noxious dusts and gases. Secondary standards are to deal with other effects, e.g. on vegetation structures and visibility. Individual States may adopt more stringent standards for special areas. States are to develop adequate monitoring plans. (2) *Performance Standards* for new stationary sources: these are to specify regulations and procedures on enforcement.

The first Federal list of emission standards (max. 2-hr. average) was issued in December 1971. It covers fossil-fuel-fired steam generators (0.1 lb dust/million Btu heat input=0.155 kg/MWh), incinerators (0.08 grain dust/scf flue gas=0.19 g/m<sup>3</sup>, 0°C), cement, nitric and sulphuric acid plants. It is not otherwise related to plant size or to local ambient pollution as is the British Memo on Chimney Heights for SO<sub>2</sub> emissions. The British regulation for dust emissions from furnaces is on a sliding scale, e.g. 7.6 lb/10 M Btu and 45 lb/100 M Btu; also not more than 20% of the emission may exceed 76 µm in diameter.

States, Counties and some Cities have Air Pollution Agencies. These are to set the above mentioned criteria and may add additional controls for emergencies, cf. partial shut-downs in California when "ozone" is excessive. Actual organization varies—in Texas all rule making power is centred at State level and enforcement power is shared by city, county and State authorities. Some State Agencies or Boards have quasi-legislative and quasi-judicial functions. The authors comment that the areas covered by some agencies are too small to ensure that the quality of staff (and income) is sufficient to cover the mix of sources and populations required for effective administration, but some smaller areas are using larger agencies as consultant contractors (cf. services by large English counties to adjacent small counties). Thus the prior approval enacted for pollution prevention from new factories or extensions requires a wide expert knowledge (cf. first registrations under the U.K. Alkali Act).

The authors also comment that some governmental operations are "a triumph of process over purpose"; the danger is that Agencies may deliver monitoring data and reports on a number of sources instead of "delivering air of acceptable quality".

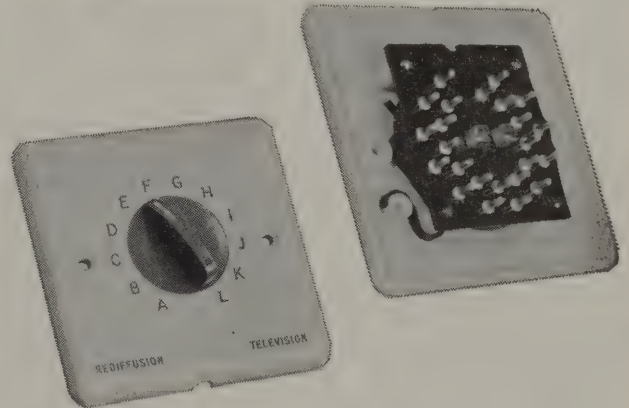
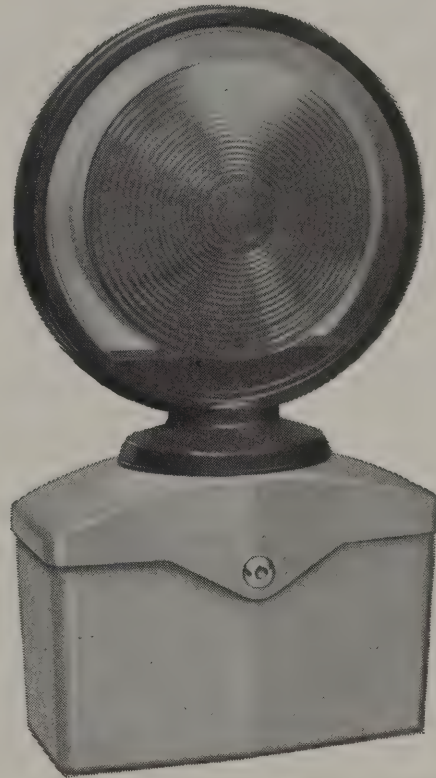
Whilst the number of research workers and associated funds is many times greater than in Europe including the U.K., the number of staff appointed by 1970 to operate air pollution control was only 2,800. This compares with about 2,000 U.K. local government Health Inspectors plus Alkali Inspectors in Great Britain with one-quarter the population and one thirty-fourth the area of the U.S.A. The estimate of 8,000 recommended by the National Air Pollution Control Administration is realistic provided they are not fettered by bureaucracy.

Consideration of the "state of the art" in the U.S.A. leads me to believe that after many trial shots there will evolve a pollution control organization which will be similar to the U.K. system of local authority regional control for most emissions and national control for processes of special difficulty.<sup>1</sup>

The above review indicates the difficulties which will have to be overcome to ensure a uniform and effective control policy in the Common Market. Reasonable uniformity is essential to prevent unfair competition. I estimate the time scale as 10 years for development of an agreed organization and another 10 years for full implementation. The Beaver Committee started work early in 1953 and there are still a few unresolved problems and many many plants to clean-up.

As for the rest of the book, the chapters on photochemical pollution and on pollution from vehicles are competent accounts of the problems and include useful data. The chapters on the emission of smoke, dust and

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gases are somewhat out of date; more important, they fail to state the operating difficulties which may be encountered and how to overcome them. These chapters would have been better written by technologists with personal process experience of the equipment they describe. A dreadful mixture of units is used for emission concentrations quoted—in one case in the same table. Most publishers now require derived S.I. units to be used with local commercial units beside them when desirable. The index is insufficient for the ground covered.

### Reference

<sup>1</sup> Nonhebel, G. British Air Pollution Regulations. Procestechniek (Holland) 30, Aug. '72, page 605; and 13 Sept., page 631 (in English). A modified version of this paper will appear in J. Environmental Planning and Pollution Control, Vol. 1, No. 3, Spring 1973.

Gordon Nonhebel

Reader Enquiry Service No. 7335

### Environmental Education: a Source Book

C. Troost and A. Altman. John Wiley and Sons, 1973. £5.55 (cloth) £4.00 (paper).

This compendium of information and ideas by two American writers covers the broad aspects of ecology and conservation of man's environment. There is a considerable bibliography almost exclusively American and one could have wished for more English sources to stimulate interest in this country. Nevertheless the material given is wide in its coverage and will prove useful to those interested in pollution prevention education.

Source books have their merits in this field but can prove somewhat limited in value, in the hands of the lazy reader or those only interested in short cuts to knowledge.

In the preface to the work, the authors rightly draw attention to the gross defacement and misuse of our environment associated with the growth of population and technological achievement. They make a strong plea for conscientious and sustained action by individuals and groups alike to make wise decisions in environmental matters in order to safeguard the future race from utter disaster. Youth generally must be taught the fundamentals and teachers must gear themselves to the task of judicious reading and effective teaching methods. Hence the source book as an aid to this end.

The book addresses itself to two major questions; the nature of the environmental crisis and the place of the schools in the action necessary to meet the crisis. Background information is provided in the first two parts while part three is devoted to school curricula and programmes of work and associated field study suitable for a wide band of age-groups in both rural and urban areas. Laboratory and classroom activities are also presented as major steps towards a proper and factual appreciation of pollution problems.

In the three parts of the book there are some 69 contributions from many sources concerning the nature of and the danger to the environment and the importance of education of youth as a means to avert any crises which might appear inescapable if proper steps are not taken in the near future.

After examining the nature of our environment and its physical and biological features, pollution problems are considered relating to air, water, land, noise, the use of pesticides, the depletion of nature resources and methods of disposal of solid and liquid waste, with discussion of solutions appropriate to each problem.

It is accepted that more education in these fields of life are important and urgently needed, particularly for

youth in the later stages of their school activity and there could be many worse methods for stimulating interest in the effect of living on this planet than those mentioned in this book as suitable for class, field and laboratory programmes.

Despite the American background of information and discussion in the book, there is much to commend it for its use as an aid to teaching the importance of attention to environmental problems at a crucial stage of Youth's development.

W. Combey

Reader Enquiry Service No. 7336

### Pollution in the Air. Problems, Policies and Priorities

Professor R. S. Scorer. Published by Routledge and Kegan Paul. 148 pages. £2.75 nett.

It is typical of Professor Scorer that at the end of his book he should say "Here, at the end, reviewers will hope to find a message to save them from the need for deep thought on the big issues discussed throughout the book, and to which this author can see a satisfactory solution coming only at the end of long discussion and experimentation by enterprising communities. What we need is a theme around which society as a whole can educate itself and adjust its attitudes so that it will develop collective instincts and aspirations appropriate to the full world.

"The whole book is, one hopes, such a message but let us simplify it as a starting point for the long discussions."

This new book by Professor Scorer is eminently readable, extremely thought-provoking and most refreshing. Not all readers will agree with some of Professor Scorer's philosophies or with his political arguments and views, but most would agree that this is a book which puts the matter of air pollution in proper perspective. Professor Scorer, while debunking the prophets of doom, also hammers the complacent. He clearly outlines the need for change from what he considers to be the present outdated systems of politics and economics. Again, not all readers will agree with his remedies; but whether they agree or not they will certainly find themselves thinking furiously.

Professor Scorer was a signatory to "Blueprint for Survival". It is therefore interesting to see him say "If the price of fossil fuel were raised by taxation and that became an habitual source of revenue for the next century, as income tax has been for the last, nuclear generation of electricity could now show a handsome profit which could be used for further expansion." To be fair, the author does acknowledge that there are some serious disposal problems for radio active wastes and "we simply cannot afford, for our children's sake, to be complacent about nuclear energy."

This is a book which all readers of "Clean Air" should read. For what it is, it is very modestly priced. But is it too much to hope that we might see it issued as a paperback?

Reader Enquiry Service No. 7337

### New additions to the National Society for Clean Air Library, available on loan

Faith, W. L. & Atkisson, Arthur A. Air Pollution. 2nd edition, Wiley Interscience, 1972.

Troost, Cornelius J. & Altman, Harold, Editors. Environmental Education: a sourcebook. John Wiley, 1972.

**Csanady, G. T.** Turbulent Diffusion in the Environment. Geophysics & Astrophysics Monographs, D. Reidel, 1973.

**Hesketh, Howard E.** Understanding and Controlling Air Pollution. Ann Arbor, 1972.

**Searle, Graham.** Project Earth: an action guide for young people. Wolfe Publishing, 1973.

**British Petroleum Company Ltd.** Gas Making and Natural Gas. B.P. Trading Ltd., 1972.

**Stichting Concawe.** A Study of the Costs of Residue and Gas Oil Desulphurisation for the Commission of the European Communities. Report Nr. 13/72. 1972.

**Stichting Concawe.** Surveying Air Pollution around oil refineries. Report Nr. 14/72. 1972.

**Committee for Environmental Conservation (CoEnCo).** Urban Pressures on the Countryside.

**Camner, Per. (editor).** Air Quality Criteria & Guides for Sweden in regard to Sulphur Dioxide and Suspended Particulates. A Report by an expert committee. Stockholm, 1973.

**World Health Organisation.** Air Quality Criteria and Guides for Urban Air Pollutants. Technical Report Series, No. 506. 1972.

**Warren Spring Laboratory.** National Survey of Air Pollution 1961-1971. Volume Two, South West; Wales; North West. H.M.S.O. 1972.

**Institution of Chemical Engineers, North Western Branch.** The Control of Gaseous Sulphur Compound Emission. Proceedings of International Conference, University of Salford, April, 1973.

**Scorer, R. S.** Pollution in the Air. Problems, Policies and Priorities. Routledge and Kegan Paul, 1973.

## ENVITEC 1973

### ENGINEERING IN ENVIRONMENTAL PROTECTION

### 8 - 14 OCTOBER - DUSSELDORF

The National Society for Clean Air, in conjunction with the Department of Trade and Industry, is organising a British Joint Venture Stand at the above International Exhibition.

The following British firms and organisations are participating, together with the National Society for Clean Air:

**AIRFLOW DEVELOPMENTS LTD.—HIGH WYCOMBE**

**AIR MASTER ENGINEERING LTD.—LEEDS**

**ALLDAYS, PEACOCK, CO. LTD.—BIRMINGHAM**

**FLEMING INSTRUMENTS LTD.—STEVENAGE**

**GLASS DEVELOPMENTS LTD.—LONDON**

**HYGROTHERM ENGINEERING LTD.—MANCHESTER**

**INTERLOGIC LTD.—HOVE**

**LODGE—COTTRELL LTD.—BIRMINGHAM**

**METRO-FLEX GROUP OF COMPANIES—LONDON**

**P&S TEXTILES LTD.—ROSSENDALE**

**REDMAN HEENAN FROUDE LTD.—WORCESTER**

**SAFETY IN MINES RESEARCH ESTABLISHMENT—SHEFFIELD**

**WARREN SPRING LABORATORY—STEVENAGE**

Concurrent with Envitec '73 will be the 3rd International Clean Air Congress 8-12 October 1973. Brochure available on request.

"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## IUAPPA

### Third International Clean Air Congress, 8th-12th October, 1973

The Third International Clean Air Congress will be held in the Congress Centre of the New Dusseldorf Exhibition Area in four parallel sessions starting on Monday 8th October and ending on Friday 12th October. In all four sessions there will be simultaneous translation facilities into English, French and German.

The papers being presented are as follows:

48 papers on "Effects on health, animals and vegetation; Air quality criteria and standards."

33 papers on "Dispersion, calculation of stack heights; Meteorological factors."

46 papers on "Chemistry of atmospheric pollutants, technique of measurements, including results from ambient air situations."

29 papers on "Strategy-planning, training, public relations' efforts."

45 papers on "Emission from industry, small business and residences; processes for reducing emissions."

9 papers on "Air pollution from road vehicles and aircraft."

At the present time there are 6 papers from Great Britain.

With federal and state subsidies, an Information Show "Environment" is being prepared for the period 8th-19th October. By means of up-to-date and functional media presentations, using modern didactics, environmental issues will be highlighted and explained to the public at large.

The Association of German Engineers will also hold a Conference from 8th-10th October at the Dusseldorf Hilton and four special topics will be presented:

- 1 Noise abatement in designing and building—challenge to the engineer.
- 2 Industrial and residential solid wastes.
- 3 Energy conversion in power plants.
- 4 Integrated construction engineering.

The International Industrial Exhibition ENVITEC '73 will be held from October 8th-14th. Organized by the Dusseldorf Fairs Corporation NOWEA, ENVITEC '73 will illustrate technical solutions to environmental problems in the areas of solid wastes, noise, air, water, monitoring and environment-conscious technologies.

Further details about the Congress may be obtained from the Society.

## FINLAND

### Symposium on Danger of Water Pollution through Air—Finland. 10th-12th September 1973

The European Federation for the Protection of Waters (EFPW) are holding a Symposium on Danger of Water Pollution through Air in Lappeenranta, Palokunnantalo, Kauppakatu 66, Finland from the 10th-12th September, 1973. This Symposium will be held in collaboration with the National Board of Waters, Helsinki.

Some of the subjects to be discussed at the Symposium are: - Danger of Water Pollution through Air; Pollution of Surface and Ground Waters through inorganic Substances; Pollution of Surface and Ground Waters through organic Substances; Special problems of water and air pollution in the wood-processing industry; Relationship between population density, civilizing activity, air pollution and water load.

## U.S.A.

Air pollution control and enforcement activity under the Clean Air Act of 1970 has been in frequent use lately. A citizen complaint, investigated by EPA, resulted in the first charge against an auto dealer for tampering with emission controls. The Justice Department charged Haney Chevrolet, Inc. of Orlando, Fla., with "rendering inoperative" the pollution control system on a 1972 car. It is the first such action taken under the tampering provision of the Clean Air Act of 1970 which prohibits anyone before a vehicle is sold, or a manufacturer or dealer after sale, to remove or tamper with emission control systems. EPA investigation showed that the air injection reactor and the transmission control spark had been removed or made inoperative. If convicted, the dealer could be fined up to 10,000 dollars per violation.

## European Symposium on Combustion

The continuing activities of many European countries in combustion research has created a need for improved communication within the field. To help fulfil this, the British Committee of the Combustion Institute is organizing a European Combustion Symposium to be held at the University of Sheffield, from 16th-21st September 1973. Further information may be obtained from: - Department of Chemical Engineering and Chemical Technology, Imperial College, London SW7.

## Letters to the Editor

*The Editor,  
Clean Air*  
Sir,

The contention that asbestos must now be considered an urban pollutant deserves more consideration than your correspondent, Mr. A. Cross, has given to it in your Spring issue. With over 3,000 uses for asbestos currently known it is only to be expected that asbestos fibres will be found increasingly in the general environment. The Air Pollution Research Unit of the Medical Research Council has found asbestos fibres in beer as a result of the widespread use of asbestos filtration pads in the brewing industry (*Nature*, Vol. 219, page 93) and the Canadian Food and Drug Directorate have also found these fibres in drinking water and a wide range of beverages including beer, sherry, port, vermouth and soft drinks. (*Nature* Vol. 232, page 332). The spraying of steel girders with asbestos, dust from brake linings, the disposal of asbestos waste and D.I.Y. activities involving the sawing of asbestos cement goods all contribute their quota of pollution to the environment. Confirmation that the general population is exposed to asbestos fibres in urban air has been forthcoming in recent years from public health workers who have been able to demonstrate the presence of encrustations of asbestos fibres in the lungs of 25 per cent to 50 per cent of adults examined at autopsies in large cities such as Belfast, Cape Town, Miami, Pittsburgh and Montreal. It has been estimated that one person in ten in Britain has these asbestos bodies in their lungs.

Undoubtedly the greater proportion of cases of mesothelioma occur in persons who have been occupationally exposed to asbestos fibres over a long period of time but nevertheless a review of 125 confirmed cases of mesothelioma undertaken by the medical branch of the Factory Inspectorate in 1968 showed that 18 cases or 14 per cent had no known contact either directly or indirectly with asbestos. One disturbing feature of mesothelioma is that it can be caused by a very short duration of exposure and one case has been recorded in which a patient had been exposed to asbestos dust for only 5 weeks.

Very little work has been done in this country on the extent to which urban air is polluted with asbestos fibres chiefly because of the difficulty in developing analytical methods sufficiently sensitive to detect asbestos fibres in small quantities. The Public Health Department at Sale, Cheshire, carried out a series of tests extending over a period of six months in 1968/69 near an asbestos waste tip. The results, however, were reassuring the highest concentration of fibres recorded being  $1\mu\text{g}$  per cubic metre. Recently the Asbestosis Research Council in conjunction with Turner Bros. have used a new X-ray diffraction technique to measure asbestos fibres in samples of air taken from the vicinity of a large asbestos textile factory at Rochdale. The results showed that the samples contained less than  $0.1\mu\text{g}$  of chrysotile asbestos per cubic metre of air.

However, in my opinion not enough work on this aspect of air pollution has yet been carried out to justify the opinion that asbestos fibres in the urban air are not an environmental health hazard.

I understand that the Asbestosis Research Council has now accepted this contention and is considering taking further samples of air in a number of representative urban and rural locations in order to estimate their chrysotile asbestos content.

Yours faithfully,

LESLIE DAVIES  
Senior Public Health Inspector  
Stockport County Borough Council

*Hurdsfield Road,  
Stockport, Cheshire*

*The Editor,  
Clean Air*  
Sir,

### Clean Air Spring Seminar, Oxford

It was my good fortune to attend the recent Spring Seminar of the National Society for Clean Air held in Oxford.

In the two days of the Seminar, six papers were presented on the problems associated with pollution from various methods of transport. The presentors of the papers went to great lengths to assure delegates that pollution from road, rail, and air traffic is insignificant in comparison with other forms of pollution. The theme of the presentors appeared to be that the various industrialists are doing their best and that, given time, all will be well. In the meantime, a plea for less hysteria from so-called environmentalists was made.

However, during the discussion sessions, speaker after speaker went to the microphone to refute many of the points put forward in the papers; seemingly this refutation was based more on emotion than on fact. One speaker condemned the presenter of one paper for putting forward "silly arguments", whilst another implored us to act emotionally, pointing out that this was the way that the Clean Air Act was born. The fact that there were 4,000 deaths in London attributed to smog in my opinion justified this emotional approach. But is there any medical evidence to suggest that road vehicles are detrimental to health which can justify the present hysterical American approach to the problem?

I left the Seminar much stimulated but feeling that the views that had been put forward were from diametrically opposed points of view. Is it not possible to have a well reasoned, middle-of-the-road point of view put forward, or have all the moderates had their day?

Yours faithfully,

G. ASHFORD,  
Chief Public Health Inspector.  
Magor and St. Mellons Rural District Council,  
Banewell, Newport.

# INDUSTRIAL NEWS

## Beckman Process Instrumentation for Leicester Pollution Study

Beckman RIIC instruments have been playing a major role in a survey of atmospheric pollution and traffic noise carried out in the city of Leicester. As a result of the survey, the city authorities have been warned that given unfavourable conditions this summer, Leicester could face a Los Angeles-type smog caused by car exhaust fumes.

This warning has come from Dr. Malcolm Fox, senior lecturer in physical chemistry at the Leicester Polytechnic, who carried out the survey with the help of a team of students taking post-graduate courses for public health inspectors.



Earlier this year Dr. Fox had become concerned that no in-depth atmospheric pollution survey had ever been carried out in Leicester. He decided to ask Beckman-RIIC if he could borrow a number of the company's air monitoring instruments to enable such a study to be carried out.

The request came at a time when Beckman was launching a "Let's clean up our nest" campaign for its process instruments so the company was only too willing to cooperate with Dr. Fox in every possible way.

In a trailer equipped with a Beckman Model 6800 air quality chromatograph, Model 400 hydrocarbon analyser, Model 951 NO/NOx analyser and an Acculab 6 I.R. spectrophotometer, Dr. Fox and his team spent one week monitoring the traffic 24 hours a day at one of Leicester's "traffic black-spots" in the centre of the city.

Initial findings have indicated that although the Clean Air Acts may have reduced the amount of sulphur dioxide in the air, this form of pollution has been replaced by the poisonous emission from vehicle engines.

Carbon monoxide readings have been found to be tolerable but 50% of cars were found to emit a high amount of hydrocarbons—the principle factors in smog—and some heavy lorries and buses were found to be contaminating the air with large amounts of nitrogen oxides.

Reader Enquiry Service No. 7338

## Cleaner Tail Gases From Nitric Acid Plants

Johnson Matthey Chemicals Limited announce the successful completion of the first year of plant-scale operation of a new catalytic system for removing nitrogen oxide pollutants from the stack gases of nitric acid plants. The installation is at BASF-Antwerpen NV, Antwerp, Belgium, a subsidiary of the giant German company Badische Anilin- & Soda-Fabrik AG.

The new system overcomes the problems previously associated with the catalytic reduction of nitrogen oxides with natural gas as the reducing fuel by using Honeycat catalyst,

a platinum-based system specially developed by the Johnson Matthey Group. Honeycat catalyst uses a ceramic monolithic support and special promoters to increase the activity of the catalyst and prevent carbon formation under reducing conditions.

The Honeycat catalyst is installed after the absorption tower and the incoming gases are preheated by heat exchange before natural gas is introduced to react on the catalyst and convert the oxides of nitrogen to colourless nitrogen gas.

The concentration of total nitrogen oxides emitted to atmosphere is dramatically reduced from normal tail gas concentrations of around 2,000 ppm, and during the first year's operation at BASF the concentration has been consistently below 200 ppm with an average level below 100 ppm. After installation of the Honeycat catalyst a better plant efficiency has been obtained.

Honeycat catalyst has been installed in some 20 plants in the USA and Canada by Matthey Bishop Inc., the Johnson Matthey subsidiary in America, and further installations in Europe are expected shortly.

Reader Enquiry Service No. 7339



## Export Order for F. E. Beaumont

F. E. Beaumont Limited, Industrial Chimney Specialists, of London have received an order to design two Beavent steel chimneys, one 45 M high x 1.5 M minimum diameter and one 90 M high x 4.5 M diameter for a boiler installation by Babcock and Wilcox Limited in South Africa. The order has been received from Beaumont's Licencees in South Africa, Messrs. Cyclop Engineering (Pty.) Ltd. who will be manufacturing and erecting the chimneys.

The contract is valued at over £50,000.

Reader Enquiry Service No. 7340

## Diesel Exhaust Emission Reduction by L.P.G. Supplementary Fuelling

### Diesel Combustion Process

Diesel engines operate at different fuel/air ratios depending upon the power required. There is no throttle therefore, theoretically, air consumption per stroke never varies; thus a weak mixture produces low power, a rich mixture high power, unlike the petrol engine which burns a constant air/fuel ratio. The fuel is burnt as a result of spontaneous combustion of the atomised droplets of gas oil which are sprayed into air, heated by compression.

In order to achieve complete combustion, each droplet of fuel must have sufficient air. This can easily be achieved at part load when there is a considerable excess of air. At full load we require to burn all the available air thus there is no excess. If perfect mixing does not take place, there are some areas in the combustion chamber having richer, and others weaker, than stoichiometric mixtures. The rich areas burn fuel incompletely and this causes smoke and carbon monoxide to be emitted in the exhaust. Perfect mixing is almost impossible, largely because the time available for mixing is so short (1/400 sec.).

When smoke is emitted by a diesel engine it can almost always be improved by reducing the quantity of diesel fuel supplied; at about 75% full fuel flow on average the smoke becomes invisible. This solution is unacceptable because the power loss is too great.

### Dual Fuel Process

To operate a diesel engine on dual fuel using 1 p.g. as the secondary fuel improves the fuel/air mixing enormously since the secondary fuel can be mixed with the air before entering the combustion chamber. The total quantity of fuel supplied to the engine remains roughly as it was on diesel alone but in most cases it has been found that about 70% diesel 30% l.p.g. gives the best exhaust emission results. Over 30% l.p.g. produces a steep rise in the unburnt hydrocarbon level emitted—this is wasteful and the overall improvement in pollution rate declines. Under these new conditions only 70% diesel fuel has to be mixed in the time available, this is a far simpler task than mixing 100% diesel with the same volume of air. The diesel fuel ignites in the manner previously described and the droplets of fuel act like multiple sparking plugs igniting the mixture of l.p.g. and air.

If l.p.g. equal in heat content to the missing diesel fuel, is mixed with the air entering the engine, engine power is restored without the emission of smoke.

### Practical Results Obtained

The effect of the Calor Gas diesel dual fuel system is shown in Table 1 below.

This table shows an unacceptable smoke level in the exhaust on normal diesel fuelling, but with 71.7% diesel/28.3% l.p.g. ratio the smoke number is almost halved.

This is only part of the story since the diesel engine is known to produce other pollutants—like the petrol engine it emits unburnt hydrocarbons, carbon monoxide and oxides of nitrogen. The table shows how these have been reduced. At the fuel level of 71.7% diesel/28.3% l.p.g. the oxides of nitrogen have been reduced by almost 20% and the carbon monoxide by 40%. Further reductions are possible but in most engines combustion becomes rough and unacceptable.

The only constituents in the exhaust to increase are the unburnt hydrocarbons, further analysis shows these to consist almost entirely of propane and propylene. These, of course, are constituents of the l.p.g., are harmless and relatively unreactive hydrocarbons. This compares favourably with the unburnt hydrocarbons produced in straight diesel and petrol engine exhausts.

The figures in Table I are for a Ford engine; an even more dramatic smoke reduction can be achieved in

larger automotive diesels, and Table II gives figures for one of the most popular automotive diesel engines in use in the U.K.—the Leyland 0600, originally designed to haul loads of 24 to 26 tons. In this case, with a level of 70% diesel 30% propane, the smoke—previously unacceptable—is virtually eliminated.

### Road Test

These static engine tests led Calor Gas Limited to carry out extensive road tests on 12 vehicles—a total of over half a million miles has now been completed with the vehicles still in perfect working order. These vehicles were set up to deliver the engine's designed power output but with between 20% and 30% of the total fuel as l.p.g. The vehicles' exhausts do not smoke at all in normal operation when using the dual fuel system. The use of l.p.g. as a secondary fuel, although beneficial in all diesel engines, cannot be used in certain types of engine, owing to the very rough combustion which results. Therefore, we do not consider pre-combustion chamber engines to be suitable for this pollution control system, this type of design is only used on small high speed diesel engines, the large automotive diesel engines are those that will benefit most from the Calor Gas system.

### Noise

There is a reduction in the combustion noise which, on some engines, is quite startling. This is sufficient in some cases to enable an engine to meet noise emission regulations where without l.p.g. it could not comply.

**TABLE I**  
Exhaust Emissions for a Ford 2500 Series Diesel Engine Taken at Constant Maximum Torque

% Diesel of Total Fuel	HC p.p.m.	CO %	CO <sub>2</sub> %	NOx p.p.m.	Smoke Bosch No.
100	20	.25	8.1	1400	6.2
83.0	85	.25	8.0	1250	5.0
77.4	110	.20	8.6	1160	5.1
71.7	130	.15	7.9	1140	3.6
66.0	140	.15	8.6	1160	3.8
55.0	215	.15	7.2	1025	2.9
43.0	330	.1	7.2	1050	1.3
32.0	440	.1	7.2	850	1.1

**TABLE II**  
Bosch Smoke Numbers for a Leyland 0600 at Full Load

Engine Speed	Fuel		
	100% Diesel	80% Diesel 20% Propane	70% Diesel 30% Propane
1000 r.p.m.	4.0	2.0	0.5
1400	6.0	2.5	1.5

For explanation of Bosch smoke numbers, see end of report.

**Equipment Required To Be Fitted**

The equipment required is simple and reliable and consists essentially of:

- 1—l.p.g. mixer
- 1—l.p.g. meter and control
- 1—l.p.g. regulator
- 1—l.p.g. shut-off solenoid
- 2—solenoid control switches
- 1—l.p.g. container and fittings

The cost of this equipment, together with installation, would be of the order of £120 per vehicle.

Rough guide to Bosch Smoke Numbers:

- No. 7—Choking black smoke.
- No. 6—Dense black smoke.
- No. 5—Above acceptable level.
- No. 4—Maximum acceptable level.
- No. 3—Readily acceptable level.
- No. 2—Barely visible smoke.
- No. 1—Invisible.

Reader Enquiry Service No. 7341

**John Zink Flare Tips Help Improve Atmosphere in Welsh Valley**

John Zink endothermic field flare tips installed at the N.C.B. Phurnacite plant in Aberaman, Glamorgan, have demonstrated how the atmospheric pollution which seriously affects the neighbouring villages of Aberaman, Mountain Ash, Abercwmboi and Cwmbach can be improved.

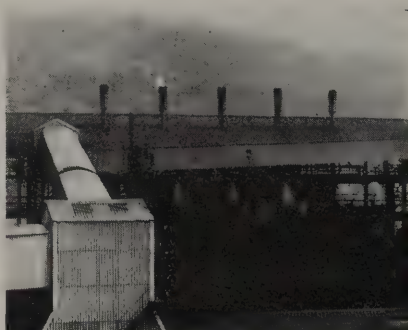
It is some 18 months ago that John Zink representatives visited the Phurnacite plant to consult on an incineration problem, and pointed out that the gaseous yellow plumes given off in the conversion to smokeless coal could be successfully cleansed. Mr. A. Ineson, N.C.B.'s general manager, then readily agreed to trials being carried out on site.

These were initiated immediately and extended over a six month period. They showed that John Zink's endothermic flare tip with the addition of a centre gas injection nozzle, oxidised the plumes given off when the Phurnacite plant ovens are discharging.

The N.C.B.'s previous efforts at control were only partially effective. The briquettes fed into the Phurnacite plant ovens for conversion into smokeless fuel give off a volatile yellow gas which is emitted into the atmosphere through stacks during discharge. The N.C.B. igniters fitted to the stacks dealt successfully with these gases in the initial stages of a cycle when, for a period of 5-10 minutes, they have a calorific value of 500 to 600 BTU's cubic foot, but were unable to sustain combustion of the leaner gases during the remaining 5-10 minutes of each cycle.



*Before*



*and After*

It is these leaner gases which the John Zink flare tips also consume by means of a flame curtain created by six propane gas burners. During the first part of a cycle only three of these burners are brought into operation but during the later stages all six are operative. Because the amount of smoke emitted varies very considerably, manual controls have been installed enabling the flares to be adjusted according to the amount of smoke. ZE Flares can, however, be installed with full automated controls when this is desirable.

So far, 15 John Zink flares have been supplied, and a further 15 are on order and will be in operation by the end of the year. Comparison between that section of the plant where the Zink flares are fitted and the remaining sections shows a marked difference in atmospheric pollution, and the very considerably improved conditions resulting have been commented on by inhabitants of the surrounding villages.

The Phurnacite plant has six batteries each of which is composed of five blocks of eight ovens, i.e. a total of 40 ovens in all. The coal, which is previously compressed into briquettes at the plant, is fed in rotation into the blocks of ovens in such a way that there are 25 discharges from a single battery every day, or a total of 150 discharges from the entire plant. The John Zink endothermic flare fitted to each block therefore functions five times during

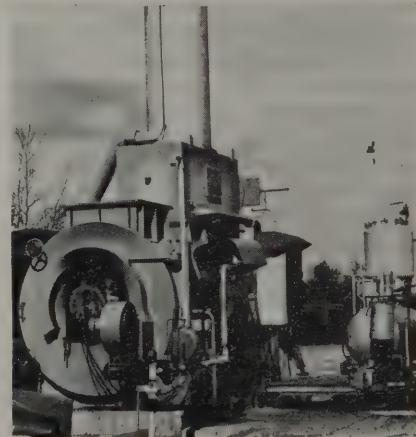
each 24 hour period. Although the average length of time a flare is in operation is 20 minutes, discharges can continue for up to an hour and the flare is also capable of dealing with this excess.

John Zink flares are used throughout the world and are normally supplied for refinery, blast furnace and coke oven application. Each tip is designed to meet the special requirements encountered at the site. The heart of the endothermic flare is the device used to mix the waste stream and air in the proper manner and proportion to achieve efficient combustion. The control of smoke formation is achieved by the addition of combustion air via steam eductors. When waste streams are too dilute to support combustion, as at the Phurnacite plant, heat is added by firing auxiliary fuel to raise the overall temperature and promote a higher degree of total combustion. The features employed to control smokeless burning are the result of many years of research and development on pilot plant studies and on full size plant in collaboration with major users. This research has been directed towards achieving efficient pollution control at the lowest possible utility cost to the user.

Reader Enquiry Service No. 7342

**Universal Incinerators Burning Perfume Smokelessly**

A Dutch manufacturer of flavours, fragrances and aromatic chemicals, was last year faced with the continuing high cost and possible pollution risk inherent in disposing of 10 tons a week of highly perfumed liquid waste. He approached the Dutch Agents of an English incinerator manufacturer, Universal Incinerators, and these agents, R. S. Stokvis & Zonen, BV, arranged for Universal to carry out laboratory and field tests. It was decided that a standard incinerator body could be used and by feeding the waste into the main combustion chamber with a blast atomiser rig, an inexpensive scheme could be proposed.



This was then demonstrated at Universal's Works in Leeds.

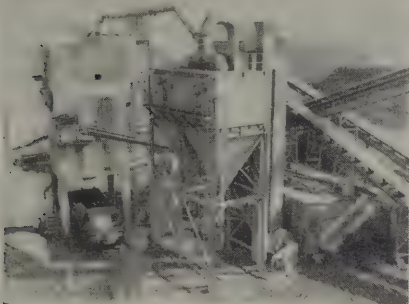
The Universal Model 4B Solvent Burning Incinerator was subsequently installed and final commissioning will be completed in July of this year. The machine is now disposing of this waste without smoke or smell at the rate of 150 kilograms per hour, 24 hours a day, five days a week.

The economics of this incinerator, against a disposal cost of £22 per ton, is so remarkable that the incinerator will pay for itself long before completing its first year of service.

Reader Enquiry Service No. 7343

#### **New Anti-Pollution Developments from Nailsea**

Two new dust filters have recently been installed by Nailsea Engineering Company Limited, of Blackburn, at neighbouring quarries near Skipton in Yorkshire—Halton East and Skibidon respectively.



*Nailsea Installation at Skibidon Quarry*



*Nailsea Engineering at Halton East Quarry*

Each of these sister installations is capable of handling 17,000 cubic feet of gas per minute from a rotary dryer and screens on road-stone coating plant. A particular point of interest is that in each case high level bunkers have been fitted for direct discharge into tankers, so that the collected waste can be removed without secondary dust nuisance.

Reader Enquiry Service No. 7344

#### **Airflow Receives C.E.G.B. Approval for Serop Smoke Monitor**

Airflow Developments Ltd. have received approval from the Central Electricity Generating Board for the Serop Smoke Monitor.

The Serop, which was designed by C.E.G.B., Plant Optimisation Instrument Dept., and developed in conjunction with Airflow Developments, is an optical probe for monitoring both smoke and dust emission in flues and chimneys. It provides a highly stable continuous signal in relation to the obscuration in the duct itself. It has adjustable sensitivity and response with two ranges, one for dust burden and the other to match BS 2978 Part 1 scale for smoke.

The output from the instrument can be read on an indicating meter and full provision is made for a connection to a matching recorder. Provision can also be made for feeding data logging equipment. The standard model may be used for both permanent installation on combustion monitoring duty and as transportable equipment for investigations on precipitator operation, combustion optimisation, etc.

Whilst reporting a considerable increase in the number of Serop units sold in this country, Airflow are also concentrating on the export market. In March, Airflow exhibited at the International Anti-Pollution Exhibition in Tokyo and Mr. Colin Wilson of the C.E.G.B. presented a paper on the Serop at the conference which was held in conjunction with the exhibition.

Reader Enquiry Service No. 7345

#### **Prevention of Air Pollution by Scrap Cable Processing**

The Dryflo process involves a dry and smoke-free method of reclaiming the copper and aluminium from scrap cables and ensures a 99% metal recovery. This method of separation avoids burning the rubber and plastic insulation thus preventing the emission of smoke, smell and poisonous fumes which pollute the atmosphere. The Dryflo process therefore provides the answer to those in this industry who are increasingly concerned with the worldwide governmental anti-pollution legislation.

The Dryflo system is also of great use for various dry mineral separation processes.

The Separator is manufactured under exclusive world licence by Dryflo Separators Limited. The company is responsible to clients for complete system design which involves all aspects of the installation including site planning and providing a consultant service for clients' individual requirements.

Dryflo's sister company—General Metal Utilisation Company Limited—operates in Wolverhampton as a fully commercial scrap cable recovery factory which is also available as a prototype for those interested in inspecting the Dryflo process. Potential purchasers are encouraged to carry out their own test work, consulting with the company's resident engineers, and even have their own personnel trained there. Experience has shown that this system of co-operation ensures the smooth running of Dryflo Separator installations throughout the world.

Reader Enquiry Service No. 7346

#### **Power Stations Will Burn More Coal CEBG/NCB Agreement Announced**

An agreement to burn more coal at power stations in 1973/74 has been reached by the Central Electricity Generating Board and the National Coal Board.

This is the first stage of a three-year agreement and is expected to increase the CEBG's use of NCB coal during the year to about 65 million tons.

The Secretary of State for Trade and Industry has agreed to provide financial assistance under the Coal Industry Act 1973 for all NCB coal burned by CEBG in 1973/74 above a datum tonnage of 58 million tons.

Mr. Arthur Hawkins, Chairman of the CEBG, said at a recent London press conference: "This agreement underlines the fact that if the price of coal is right then the CEBG can immediately step up its coal burn without putting in a single extra megawatt of coal-fired plant. It is also important to recognise that the agreement will not blur the cost-saving objectives of either the CEBG or the NCB in their day-to-day operating and trading arrangements".

He pointed out that in the last 10 years the CEBG had invested well over £1,000 million in new coal-fired power stations and today two-thirds of its capacity was coal-fired. In the year 1972/73 the CEBG had bought NCB coal worth over £340 million at the pithead.

"We shall continue to be the coal industry's largest single customer for many, many years and welcome any arrangements that help this great industry on which so much of Britain's wealth was built", said Mr. Hawkins.

NCB Chairman Mr. Derek Ezra said this new agreement would play a major part in maintaining the size and ensuring the viability of the coal industry.

"There is a close and continuing partnership between the NCB and the CEBG to provide the power needed by homes and industries throughout the

country", said Mr. Ezra.

"CEGB power stations will continue to use about half our entire deep-mined output. About 50 million tons of the coal will be supplied from our coalfields in the Midlands and Yorkshire.

"Financial assistance under the new

Coal Industry Act will give the help it was intended to provide, by enabling a bigger tonnage to be supplied from our coalfields."

Discussions are taking place between the NCB and the South of Scotland Electricity Board on the coal burn for Scottish power stations for 1973/74.

## Pollution Control Staff—Training and Manpower Needs for the Future

*Evidence to the Royal Commission on Environmental Pollution*

The Institution was founded in 1895 and draws its membership both in the United Kingdom and overseas from consulting engineers, engineers serving in central and local government including water undertakings and river authorities and from the industrial and academic fields.

A public health engineer is defined in the Articles of Association as one who is by education, training and experience competent in public health engineering, who is specially knowledgeable upon matters of public health and who is particularly concerned with the development of both the built and the natural environment as they affect the health of the community.

The Institution sees pollution control as having several aspects including design, operation, monitoring and research. These functions call for adequate and well qualified staff in various disciplines.

The consequences of local government reorganisation and the setting up of regional water authorities will introduce major changes in the areas of responsibility. The powers to be vested in these new authorities will demand greater specialisation in the many fields of pollution control. This, the Institution welcomes but foresees that increased specialisation will call for education and training of staff in greater depth than is currently available to cope with the many and varied problems of pollution. This point was discussed in the reports of the Working Parties on Sewage Disposal published in 1970 and of Refuse Disposal in 1971. These gave encouragement to the development of post-graduate education in public health engineering.

The Institution suggests that the functions on which pollution control staff will have to be engaged in the future can be classified under the following heads: -

- 1 Surveys and Investigations
- 2 Design of Installations
- 3 Plant Operation and Process Control
- 4 Maintenance of Plant and Building
- 5 Monitoring
- 6 Research and Development
- 7 Management and Personal Control

These are the elements that make up an effective pollution control service whether this be in the area of the responsibility of the new local government, units or the regional water authorities. They will require staff with basic qualifications in various branches of engineering and science e.g. civil, mechanical, chemical and public health engineering, chemistry and biology.

The co-ordinator of these functions should be an engineer with a strong public health engineering background.

Pollution Control can be classified under the main elements—of air, land and water. Staff and organisation required will need to reflect the different problems involved in each type of pollution and the nature of training will vary accordingly. The problems are likely to be of the following character.

### *Air Pollution*

The monitoring function in air pollution control will, under reorganisation, be the general responsibility of County and District Councils. Much of this organisation is well established and there will not be too great a disruption of the present service. There is a case for a qualification to higher national certificate level followed by a basic training in the fundamentals of the work for which a special course would be justified. The existing institutional qualifications (e.g. Institute of Fuel, Diplomas of the Royal Society of Health and of the Public Health Inspectors Education Board) might form the basis for a test of professional competence. At a supervisory and county level the aim should be an entry qualification at degree level with further specialised training. It would seem that there is a case for the Alkali Inspectorate to provide the control and organisation at national level.

### *Land Pollution*

Under this heading, it is necessary to consider the disposal of solid waste which almost always involves the deposit of residues on the land. The reduction from 1,300 to 42 authorities in England and Wales will necessitate a new approach to the subject of solid waste disposal. The trend towards the use of large scale plants will continue so as to gain the advantages of economies of scale. This development will call for further research and will lead to new design techniques. Disposal authorities will need to employ more highly qualified staff to deal with the wider variety of solid refuse including sludges and industrial wastes. The training requirements here are for fully qualified engineers with a public health engineering background and supporting technical staff at least at the level of higher national certificate with competence in this field. Additionally, there will be a need for an adequate inspectorate to control and monitor the disposal of industrial waste. Other forms of land pollution including pesticides, fertilisers and sludges which may contain toxic materials, will require specialised laboratory facilities and access to expert opinion.

# NATIONAL SOCIETY FOR CLEAN AIR

## 40th ANNUAL CONFERENCE

### TORQUAY

15—19 OCTOBER 1973

#### OPENING SESSION—MONDAY 15th OCTOBER

20.30 The Conference will be opened by Mr. Derek J. Ezra, M.B.E., Chairman of the National Coal Board. The President will deliver the annual address.

#### SESSION TWO—TUESDAY 16th OCTOBER

10.00 "SMOKE CONTROL—A STOCKTAKING OF THE PRESENT POSITION" (Autumn 1973).  
Mrs. A. Moss (*Department of the Environment*)

#### OPEN SESSION—TUESDAY 16th OCTOBER

14.30 "THE INVASION OF THE SOUTH WEST'S ENVIRONMENT"  
Lady Sayer (*Chairman, Dartmoor Preservation Association*)  
and P. Turnbull (*County Planning Officer, Devon*)

#### SESSION FOUR—WEDNESDAY 17th OCTOBER

09.30 "GRIT AND DUST FROM COMBUSTIVE AND NON-COMBUSTIVE SOURCES"  
K. Darby and K. R. Parker (*Lodge Cottrell Ltd.*)

#### SESSION FIVE—THURSDAY 18th OCTOBER

10.00 "LIVING IN POLLUTED CITIES"  
F. J. C. Amos (*City Planning Officer, Liverpool*)

#### SESSION SIX—THURSDAY 18th OCTOBER

14.30 "POLLUTION AND HEALTH"  
Dr. R. Murray (*Medical Adviser, Trades Union Congress*)

#### SESSION SEVEN—FRIDAY 19th OCTOBER

10.00 "THE EFFECT OF SOME AIR POLLUTANTS ON FARM ANIMALS"  
Dr. L. H. P. Jones and D. W. Cowling (*The Grassland Research Institute*)  
"THE EFFECT OF PESTICIDES ON LIFE IN THE SOIL"  
J. Newman (*Plant Protection Ltd.*)  
"EFFECTS OF NITRATES ON FARM ANIMALS"  
A. H. Walters.

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NATIONAL SOCIETY FOR CLEAN AIR

OPEN MEETING & LUNCHEON

London, Tuesday, 26th June 1973

OPEN MEETING

At 12.15 p.m., immediately after the Annual General Meeting of the Society there will be held, at the Connaught Rooms, Great Queen Street, London, W.C.2., an Open Meeting, to be addressed by Mr H. B. Greenborough, the new President of the Society and at which the

ARNOLD MARSH CLEAN AIR AWARDS

will be presented by Mrs Doris Marsh to:

- Dr Gordon Nonhebel
- Dr Albert Parker
- The Corporation of London
- The City of Salford
- The City of Sheffield
- The British Petroleum Co. Ltd.
- The Central Electricity Generating Board

LUNCHEON

Following the Open Meeting, the Society's Annual Luncheon will be held at the Connaught Rooms, at which the recipients of the Arnold Marsh Clean Air Awards will be guests.

Members are invited to bring friends with them to the luncheon, tickets for which will be reserved on receipt of the application form below together with the appropriate remittance. The price per ticket is £3.25 inclusive of gratuities and pre-luncheon drinks.

-----

The Director,  
National Society for Clean Air,  
136 North Street,  
Brighton BN1 1RG

Please reserve and forward in due course.....ticket(s) for the Luncheon on 26th June 1973, for which I enclose £3.25 per ticket. (*Cheques payable to the National Society for Clean Air*)

Signed.....

Name and address for tickets. Please indicate names of any guests (BLOCK letters, please)

.....

.....

# CLEAN AIR

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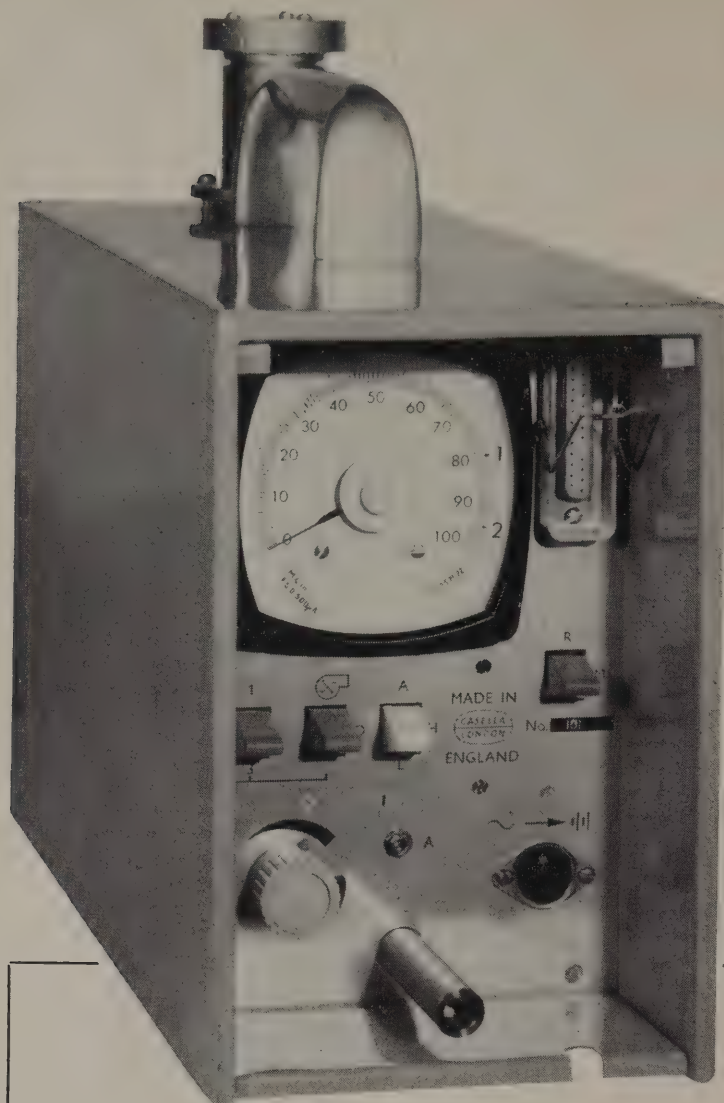
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*Incorporating "Smokeless Air"*

**AUTUMN 1973**

**VOL. 3 NO. 11**

## **PRINCIPAL CONTENTS**

**The Annual General Meeting**

**Annual Public Meeting, Address by the  
President, Mr. H. B. Greenborough**

**Lecture given to NSCA by Professor  
M. W. Thring**

**The Society's New President**

**Clean Air and York, David Goodall,  
Bryan Gray and Robert Smith**

**The Cost Of Removing Lead From  
Petrol**

**Smoke Control Areas**

**Book Reviews**

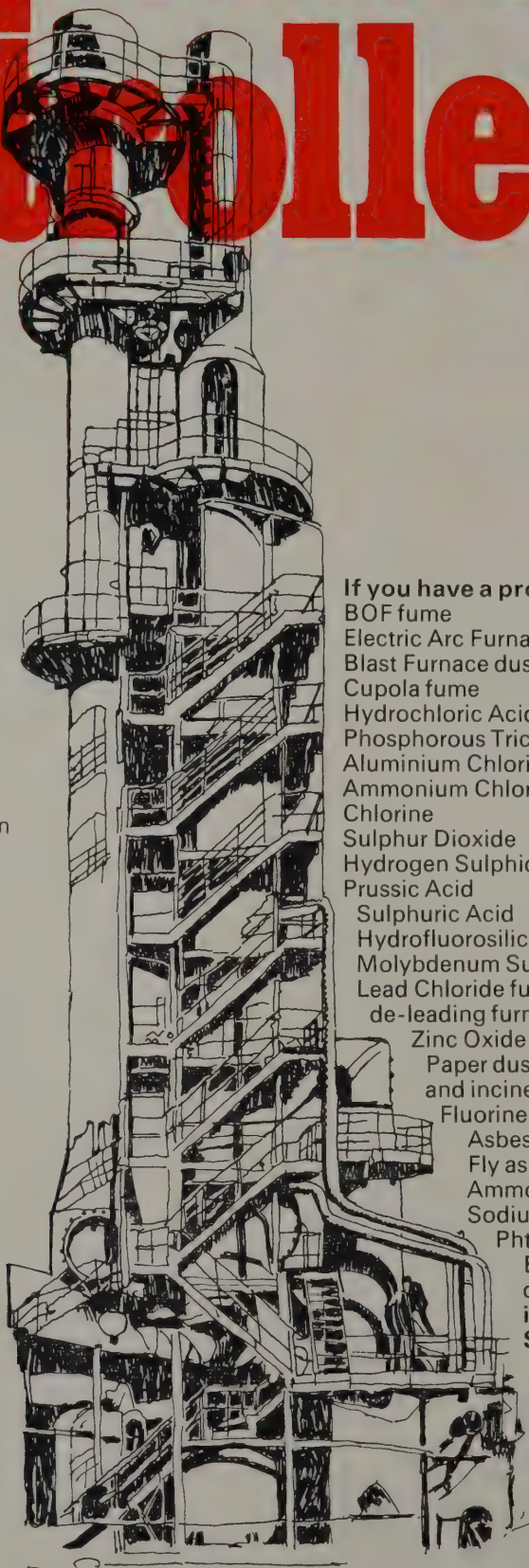
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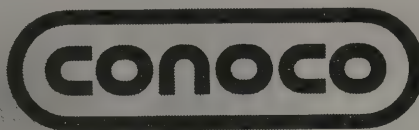
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# CLEAN AIR

## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

Vol. 3 No. 11

Autumn 1973

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"This most excellent canopy, the air"

# CLEAN AIR

## Reconstruction of the Society

Throughout its history of nearly 75 years, one of the Society's strengths has always been that it has been prepared to move with the times, to face up to new problems and to make changes in its own structure to enable it to utilise its own resources to the best advantage. So in the past what was the Coal Smoke Abatement Society became the National Smoke Abatement Society, and this, in turn, became the National Society for Clean Air.

In 1969 after some ten years had elapsed since the National Society for Clean Air as such was formed, the Executive Council decided to review the existing situation with a view to making any changes which were shown to be necessary. At that time, there were three main matters of concern: premises, as the lease on the Society's premises in London was expiring, the staff, which was somewhat ill-balanced for the task to be done, and the Society's terms of reference. At the same time it was felt that the composition of the Executive Council and its Committees should also be examined.

The outcome was the forming of a small Steering Committee which held a series of meetings for over twelve months, starting in February 1970. The Committee made recommendations which led to the move of the headquarters to Brighton in July 1970. The move to Brighton precipitated the necessity for staff changes in view of the fact that few of the existing staff were prepared to leave London. Opportunity was therefore taken to streamline the staff on the lines proposed by the Steering Committee and which were approved by the Executive Council.

The next task was to consider the Society's terms of reference and the possible reconstruction of the Executive Council and its Committees. These discussions took place just after the Maude Report on the reorganisation of local government had been published. However, a change of Government in June 1970 caused the Maude Report to be scrapped. Specific proposals which were made in February 1971 were circulated to the Divisions for their comments, but by the time the comments of the Divisions had been received, the present Government published its own intentions about local government reform. It therefore was not opportune to consider changes in the Society at such a time, although it was fully appreciated that the proposed changes in local government would have a profound effect upon the Society and its work. But as soon as the main changes to be made in local government became clear, the Council appointed a special sub-committee to examine these and their possible effects on the Society.

The Reconstruction Sub-Committee first met in September 1972. At the end of January 1973 they made specific recommendations to the General Purposes and Finance Committee. The General Purposes and Finance Committee accepted the recommendations but sought the views of Divisional Councils. The General Purposes and Finance Committee then reconsidered the recommendations in the light of the comments from the Divisions and submitted amended recommendations to the Executive Council at a special meeting on the 20th June 1973. Before the meeting considered these recommendations in detail, the Chairman of the Council, Mr. Stanley Cayton, outlined the background to the proposals; there was a continuing need for the Society to show that it was thinking more widely about the problems of pollution, but the proposed changes were not intended in any way to usurp the work of any other organisations.

## *The Proposed Changes*

The first proposal is that the name of the Society should become the "National Society for Clean Air and Pollution Control".

The change of name reflects proposed changes in the terms of reference and objects of the Society. These are set out in Article 3 of the Society's Memorandum of Association and it is suggested that these should be less restrictive. The clause in the Articles which reads "To create and promote by publicity and education an informed public opinion on the value and importance of clean air", should be expanded to read "To create and promote by publicity and education an informed public opinion on the value and importance of clean air and pollution control". This does not in any way mean that the Society will not concern itself with matters of clean air in the future. Far from it; but the proposed change does mean that the way in which the Society has now been looking at all problems connected with clean air right through will be ratified. In recent years we have all been much more aware of the pollution cycle: it is no good scrubbing blast furnace gases if there is going to be difficulty in disposing of the effluent; it is no good using incineration as a means of waste disposal unless proper attention is paid to the cleaning of flue gases.

The Executive Council in future will be "The Council of the Society" and its size will be increased to enable better and more balanced representation from Divisions and from national and other organisations such as industry, learned societies, institutions and universities. Representation from such organisations would be at the invitation of the Council and such representation would be reviewed annually. This enlarged Council, it is hoped, will not allow itself to become too involved with matters of detail which will continue to be dealt with by the appropriate Committees, by headquarters and the Divisions. The Council would, however, as hitherto concern itself with reports from its Committees, from the Divisions and from headquarters and from any subject groups, but its main function would be to give a lead in matters of policy, and such matters should be thoroughly debated.

The Council would continue to be supported, as at present, by four Committees: the General Purposes and Finance Committee, the Technical Committee, the Conference and Publicity Committee and the Parliamentary and Local Government Committee.

Changes are suggested in the composition of the Divisions of the Society to bring their new boundaries into line with the changes that will take place in April 1974 on the local government map. Two entirely new Divisions will be created. The twelve new Divisions with their composition are:

<i>Division No</i>	<i>Division</i>	<i>Area</i>	<i>Division No</i>	<i>Division</i>	<i>Area</i>
1	Scotland	Scotland	8	Eastern	Norfolk Suffolk Bedfordshire Essex
2	Northern Ireland	Northern Ireland			
3	Northern	Cumbria Northumberland Durham Tyne and Wear Cleveland	9	London and South East	Greater London Kent Surrey Hertfordshire East Sussex West Sussex
4	North Western	Lancashire Manchester Merseyside Cheshire Clwyd Gwynedd	10	Central Southern	Hampshire Isle of Wight Berkshire Oxfordshire Buckinghamshire
5	Yorkshire	North Yorkshire West Yorkshire South Yorkshire Humberside			
6	West Midlands	West Midlands Salop Staffordshire Warwickshire Hereford and Worcester	11	South Western	Gloucestershire Avon Wiltshire Dorset Somerset Devon Cornwall
7	East Midlands	Derbyshire Nottinghamshire Leicestershire Lincolnshire Cambridgeshire Northamptonshire	12	South and Mid Wales	Wales except for Clwyd and Gwynedd

As from 1974, Divisional representation on the Council of the Society will be for a term of three years. One third of the members of Council will retire each year and be eligible for re-election. A postal ballot will not be carried out from headquarters, but Divisions will be responsible for making their own nominations and, when necessary, holding their own elections. These elections will usually be made at the Divisions' Annual General Meetings.

The changes in the local government map and the creation of the new district councils will have a profound effect on the local authority membership of the Society. It is the intention in the course of time—and it is hoped that this will be early—to try to recruit all the new local authorities as members of the Society, and having regard to the size of the new local authorities a new scale of subscriptions based on population has been proposed by Council. These subscription rates take into account the fact that not only will many of the Society's smaller local authority members

disappear, but also recent inflationary tendencies. The Society, just like any other organisation or person, is affected by such things. In the same way, there has been a revision of rates of subscription for corporate members and these rates have been rationalised to take account of the constitution of the member concerned. Provision has been included for what might be termed "small" corporate member such as the local civic society, a school or college. So far as individuals are concerned, the subscription will remain unchanged at £3.00. Provision is being made for student membership at a reduced fee and there will be a means whereby older members can pay a fixed sum which will carry the privilege of membership for life.

All these proposed changes will be drawn up as Resolutions and Special Resolutions and laid before a General Meeting of the Society. These resolutions will be promulgated individually to every member of the Society with the notice of the Meeting. It is not yet known what the date of the General Meeting will be, but it will probably be in the autumn and adequate notice will be given to all members and representatives.

Over the years the Society has made changes within itself to deal with changes in the environment. These have been evolutionary; the proposed new changes, too, are evolutionary.

---

## More Information About Clean Air

The release of more information on industrial emissions to the atmosphere is supported by a Working Party of the Clean Air Council in a report issued 9th July as a consultation document by the Department of the Environment.

The Working Party recommends that next year's new district authorities should be empowered to set up special local committees on industrial emission to the atmosphere. Such committees should be representative of the local authority, local industry and the local public. They would have a duty to collect and consider information about air quality and emissions to the atmosphere; to publish reports; and to act as a local source of knowledge.

The main basis of information should be that which industry would normally supply to the local Public Health Inspector or Alkali Inspector.

The committees should be financed by the local authorities, but operate independently. Press and public should be admitted to committee meetings in the normal way. Number of members should be limited to 15.

The Working Party, under the chairmanship of Rear Admiral P. G. Sharp, C.B., D.S.C., Director of the National Society for Clean Air, was set up in July 1972 to consider certain recommendations on publication of information about industrial wastes made by the Royal Commission on Environmental Pollution in their second report (March 1972, Cmnd 4894).

In their report the Royal Commission stated that they doubted some of the reasons given for withholding information about the nature and quantities of industrial wastes released into the air, rivers and estuaries or dumped on land or at sea. They considered it in the

public interest that information about wastes should be available not only to statutory bodies with a right to demand it but also to research workers and other responsible persons who could make use of such information to improve the environment. The Commission urged Government departments involved in pollution control to hold consultations with a view to devising measures to increase the flow of information about industrial effluents and wastes.

The Working Party report points out that although during recent years there have been great improvements in cleanliness of air, including increased control over industrial emissions, no single recognised source of information on emissions exists. People were in need of reliable authoritative sources of information in their own neighbourhood; and in the field of industrial emissions there was a need for information to be considered and presented to the public in true perspective.

The Working Party state that evidence given to them strongly supported a system of local committees, based on the principle that a system of local reports would be of more value than central reports. Appropriate officers should be in attendance as necessary, and the District Alkali and Clean Air Inspector for the area should be ready to give advice on request. Copies of reports by the committees should be sent to the Department of the Environment.

The Clean Air Council have noted with approval the analysis in the report and proposed that it should now be circulated widely so that the views of as many as those concerned as possible may be known before decisions are taken on the recommendations.

Copies of the report are available on request from the Department of the Environment (Room 541), Queen Anne's Chambers, 28 Broadway, London S.W.1, (telephone: 01-930 4300, extension 338).

## THE ANNUAL GENERAL MEETING

The Society's Annual General Meeting was held on Tuesday, 26th June, at the Connaught Rooms, Great Queen Street, London. The chosen day was an extremely hot and humid one but in spite of the counter attractions of tennis at Wimbledon and Test cricket at Lords, the attendance was good.

The Chairman of Council, Mr. S. Cayton, M.B.E., was able to report that the Society had enjoyed a very active year and the Honorary Treasurer, Dr. W. C. Turner, was again in the happy position of being able to tell members that the financial position of the Society had improved considerably. After the business side of the meeting had been completed, the retiring President, Mr. Stanley E. Cohen, C.B.E., C.C., F.R.S.A., invested the Society's

new President, Mr. Hedley B. Greenborough, the Managing Director and Chief Executive of Shell Mex and B.P. Ltd., with the chain of office as President. Mr. Cohen referred to his happy time as President during the past two years and to the previous fourteen years when he had been Honorary Treasurer. He expressed satisfaction at seeing some of the earlier objectives being fulfilled although he pointed out that there were still problems to be solved. In introducing Mr. Greenborough, Mr. Cohen referred to Mr. Greenborough's eminence in the oil industry and was sure that as President of the Society he would be in a position to enhance its progress. Mr. Greenborough thanked Mr. Cohen and said that it was not only an honour to himself, but also to the oil industry as a whole, that he should become President of the Society.



*Mr. Cohen invests his successor, Mr H. B. Greenborough, with the President's chain of office.*



*Some of the audience.*

The Annual Public Meeting followed the Business Meeting and this was very well attended. The main item was the presentation of the Arnold Marsh Clean Air Awards to Dr. Gordon Nonhebel, Dr. Albert Parker, the Corporation of London, the City of Salford, the City of Sheffield, the British Petroleum Company Ltd., and the Central Electricity Generating Board. The Society was indeed fortunate that Mrs. Doris Marsh, the widow of the late Arnold Marsh after whom the Awards had been named, was able to come and present the Awards in person. This was very much appreciated by the recipients and by all members who were present.

Following the presentation of the Awards, the new President, Mr. H. B. Greenborough, addressed the meeting. His address, which took the form of a stocktaking of the present position, is reproduced in full later in this issue.

The Annual Luncheon held after the Public Meeting was a very happy and enjoyable occasion. The President, Mr. H. B. Greenborough, proposed the toast of the guests on whose behalf the reply was made by Alderman Mrs. Patience Sheard, C.B.E., of Sheffield.

We take this opportunity of welcoming Mr. H. B. Greenborough as President of the Society, but at the same time would express our gratitude to our retiring



*Mrs. Doris Marsh hands Mr. Cohen the Award for the Corporation of London.*



*Dr. Albert Parker receives his Award.*

A brief biography and photograph of Mr. Greenborough, our new President, appear later in this journal.

#### **Chairman of the Executive Council**

Mr. Stanley Cayton has been succeeded as Chairman of the Council by Mr. Wilfred Combey. Mr. Combey, formerly the Chief Public Health Inspector of Oxford, is well known to the Society and the clean air movement as he has been Deputy Chairman for the past four years. He is Chairman of the South Eastern Division and for the last two years was Chairman of the Society's General Purposes and Finance Committee. As Chairman of the Reconstruction Sub-Committee he has been very closely associated with the recommendations put forward for the restructuring of the Society in the light of the imminent local government changes. He takes office at a time when these changes are about to take effect and this period will be a very important one in the Society's history.

President, Mr. Stanley E. Cohen. In his two years of office he has done much to benefit the Society and to further the cause of clean air. This was a projection of all the work that he had done on behalf of the Society and for the cause of clean air during his period of office as Honorary Treasurer for the previous fourteen years. The Society owes a lot to Mr. Cohen and we are indeed grateful to him for all that he has done. In his present office of Immediate Past President, however, we will still have the benefit of his wisdom and advice for some considerable time to come.

We are extremely grateful to Mr. Stanley Cayton for all his work as Chairman during the past two years and as a Deputy Chairman before that. He has worked extremely hard for the good of the Society and has been a notable ambassador not only for the Society, but also for the clean air movement generally during his very busy period of office. Mr. Cayton will still be a member of the Council for some time to come and we are fortunate that we shall continue to have the benefit of his experience and great knowledge.

## **TOWARDS CLEANER AIR**

### **A BRIEF SURVEY OF AIR POLLUTION**

by

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*Director, National Society for Clean Air*

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## NATIONAL SOCIETY FOR CLEAN AIR

# Annual Public Meeting, Tuesday, 26th June 1973

### Address by The President, Mr. H. B. Greenborough

I am very pleased that the Society has been able to institute a series of awards to those who have rendered outstanding service to the clean air movement, and I congratulate the first recipients of these awards on this well-merited recognition of their work. It is fitting, too, that these awards should have been named after Arnold Marsh, the first director of the Society, who was labouring devotedly in this field long before the cause became so fashionable. Looking at the list of recipients and their citations, two points occur to me. The first is that, although the present spate of publicity on environmental matters might give the impression that the state of the environment has only become a matter of concern in the past five years or so, in this country at least we have a very long history of environmental action. History shows, for example, that the City of London has been involved with and concerned about pollution problems for centuries. It was also the first local authority to declare its whole area as a Smokeless Zone. This was in 1954, two years before the first Clean Air Act. Similarly, Salford and Sheffield both have a history of action in regard to air pollution going back for more than a century. I need hardly remind this audience that this Society and its forerunners go back to the formation of the Coal Smoke Abatement Society in 1899.

Perhaps because this country was the first to experience the effects of the Industrial Revolution, it has a longer history than any other of action in the environmental field. This brings me to the second point arising from these awards, which is related to the first and is, I believe, unique to this country. The awards have been presented to two individuals, three local authorities and two industrial concerns. This illustrates the characteristic feature of environmental action in the United Kingdom over the past century, namely the close co-operation which exists between government, local authorities and industry in effecting improvements. They, in their turn, have been stimulated and kept up to the mark by individuals working either on their own or through the medium of voluntary organisations.

Typical of this approach has been the way in which the Alkali Inspectorate, now 110 years old, has throughout its history worked in co-operation with industry to achieve the best practicable means of reducing pollution. Its legal powers have generally been held in reserve and, while they may be used in the last resort, it has always sought to secure results through voluntary agreement. Whatever structural changes may be decided concerning its relationship with the new safety and health executive, I sincerely hope that the Alkali Inspectorate's traditional effectiveness will be maintained together with its present close working relationship with industry.

This close relationship between industry and statutory bodies such as the Alkali Inspectorate has recently come

under fire on the grounds that the relationship is altogether too cosy. There are those who consider that a tougher attitude is required and that the potential polluter should be more tightly controlled by laws and regulations. I would not wish to embark on this contentious issue except to say that, in my opinion, the British system has achieved results in terms of improvements to the environment which have been more striking than those brought about in other countries where a system of legal confrontation between government and industry has been adopted and where, inevitably, entrenched positions have been taken up on both sides.

One has to guard against complacency in considering the truly remarkable improvement in the cleanliness of the air that has been achieved in London and other major cities in the years since the 1956 Clean Air Act. A major factor in this improvement has been the growth in domestic central heating, using smokeless fuels, including natural gas from the North Sea. I need hardly stress to this audience the role which this Society has played in helping to bring about this improvement. Nor does it apply only to the major cities. Elsewhere in the country, too, good progress has been made, and now that the shortage of solid smokeless fuel, which slowed down progress during 1970 and 1971, has been overcome, there has been a heartening increase in the number of smoke control areas introduced. Even so, there is still a good deal to be done in the field of smoke control. There are still too many districts which have not yet introduced smoke control orders. We should surely now gear ourselves for a final push to achieve the introduction of smokeless zones over all the urban areas of this country.

So much for the past. Let us now look at some of the factors which are likely to affect the work of this Society in the years to come. The accession of the United Kingdom to the EEC will clearly have an influence on environmental action in this country. Mr. Rippon has said that he believes that an environmental programme for Europe should concentrate on those aspects which are of genuine international concern. Because of the international nature of its utilization, the motor vehicle is clearly one of these. The United Kingdom has already introduced regulations for the control of vehicle exhaust emissions which conform with ECE Regulation No 15 and which should have the effect, in vehicles first used on or after 1st October 1973, of reducing emissions of carbon monoxide by up to 30% and hydrocarbons by up to 10%, as compared with the emissions from an uncontrolled vehicle. The Government has already announced a programme for the phased reduction of the lead content in petrol, and discussions are at present in progress within the EEC with a view to producing a common standard. Discharges of waste into the sea, collaboration in research, surveys and monitoring of

pollutants and the exchange of technology are other areas where fruitful co-operation may be expected with our partners in the EEC.

Perhaps because such good progress has been made in the reduction of atmospheric pollution, more attention is now being paid to objectionable smells. The Department of the Environment has, as you probably know, set up a working party to consider odours from offensive trades and other selected processes, and this Society will be watching their progress with interest.

In his presidential address last year, Mr. Cohen referred to the fact that it is more and more necessary to consider the environment as a whole. This was a message which emerged very clearly from the United Nations Conference at Stockholm in 1972. One cannot look at air pollution in isolation without considering its interaction with other forms of pollution, such as water pollution. The Society is, I know, carefully considering how far it should extend its activities into other areas of the environment while retaining its acknowledged authority on clean air. There is one area which is closely analogous to air pollution and that is noise. In terms of its effect on health and amenity, both in the home and at work, noise is one of the most pressing of the present-day environmental problems. It is encouraging that in a number of his speeches Mr Rippon has laid stress on the importance which he attaches to noise as a pollutant, and it is likely that the forthcoming Environmental Protection Bill will include measures for more effective control of some types of urban noise. This is an area in which I hope the Society will be able to develop its activities, in collaboration with other bodies active in this field.

Now I come to a problem to which I certainly would not pretend to have all the answers and, indeed, he would be an exceedingly rash man who claimed that he had. I refer to the widespread concern which is being expressed about the way in which we are using up the world's natural mineral resources, and particularly energy resources. I do not subscribe to some of the more alarmist views which have been expressed recently. Extrapolation of existing trends and infinitum can be thoroughly misleading and I suspect that some of the pessimists under-estimate the technological ingenuity of the modern world in overcoming the problems with which it is faced. Nevertheless, bearing in mind the finite nature of our fossil fuel resources, we must make a less wasteful and more efficient use of them. An analysis of the fossil fuel consumption in the US, Japan and Western Europe shows that about half of the total is wasted in the process of conversion of fuels into more convenient forms of energy and in the transportation of energy. The reasons for these losses are the low inherent efficiency of power generation and of transportation and, to a lesser extent, inefficiency losses in industrial processes and in domestic and commercial heating equipment. In addition, substantial avoidable losses are incurred in the use of energy; for example, by insufficient insulation of buildings and inefficient uses of cars and other means of transportation due, for example, to traffic congestion. With the discovery of natural gas in the North Sea and the subsequent discovery of indigenous oil supplies in the same area, the UK has moved into a four-fuel economy—coal, oil, natural gas and nuclear energy. We need to look more closely at a more rational use of our energy resources so that we use the right fuel for the right job. This means that particular fuels should preferably be employed for those purposes where they are either used most efficiently or where they hold a unique position. At the same time, we need to ensure that the conversion of fuels into energy

is carried out with the maximum efficiency and that wastage is reduced to a minimum. In this country, in particular, much could be done to reduce wastage of heat through improved insulation of buildings. To the extent that such measures reduce the consumption of fuels and ensure that they are burnt efficiently, they could be of direct assistance in improving the cleanliness of our air.

On the other hand, there can be an inherent conflict between actions taken to reduce air pollution and attempts to increase the efficiency of energy use. A notable example is transportation. Not only in transportation inherently a very low efficiency area, but anti-pollution measures can quite dramatically worsen the situation. Thus, it has been estimated that US petrol consumption could go up by some 15-20% in order to meet the 1975/76 emission standards for motor vehicles. I hasten to say that I am not here indulging in special pleading on behalf of the oil industry; I am merely posing the problem. There is a dilemma here which has to be faced. We need to find the optimum means of reconciling improvements in the cleanliness of the air with economy in the use of our resources. In the case of the motor vehicle, this means looking for ways of reducing exhaust emissions which do not involve increased consumption of motor fuels, and the recent announcement by the Department of Trade and Industry's National Engineering Laboratory about a device for reducing car pollution is an indication that research is going on along these lines.

On the subject of air pollution from industry, you will no doubt be aware that Admiral Sharp has been the Chairman of the Working Party on the disclosure of information regarding industrial emissions to the atmosphere. It is hoped that the report of this Working Party will be published in the reasonably near future. This is not an easy problem and the recommendations of the Working Party will be of considerable interest to members of this Society.

The reorganisation of local government has entailed significant changes in the responsibility for the control of air pollution. The responsibility for clean air has been placed on the district councils and, under the new organisation, they will be responsible for all aspects of air pollution apart from those which are under the control of the Alkali Inspectorate. This will mean that these authorities will become involved in a wide range of technical problems and I believe that there will be opportunities for the Society to help them by arranging appropriate seminars and conferences. I hope that all the new authorities will find it to their advantage to become members of the Society.

I have reviewed briefly some of the areas which I foresee will engage the Society's interest in the future. There are, of course, many more. The improvements to the cleanliness of the air which have already taken place should encourage us not to complacency but to further effort. The people of this and other countries continue to demand a higher quality of life, and rightly so. As one aspect of pollution is dealt with, so others come to the fore. It would be pleasant to foresee a future in which there is no longer any need for a National Society for Clean Air. This may come about one day but for as far ahead as one can foresee, there will be plenty of work for this Society to do. I am confident that the Society will be as effective in the future as it has been in the past in helping to bring about the environmental improvements which we all desire.

# The Society's New President



Mr. H. B. Greenborough joined Shell Petroleum in 1939 and was later seconded to the Petroleum Board. His war service included a period of detachment to the R.A.F. Volunteer Reserve during which he trained with the U.S. Navy, and in 1944 he became a Lieutenant in the Fleet Air Arm. He rejoined Shell in California in 1946 and was transferred to Shell-Mex (Brazil) Limited in 1947, attached to Management, becoming Manager of the Para Branch in 1951.

He next went to Rio de Janeiro as Manager, Retail Marketing Department and in 1955 was appointed Regional Manager. Afterwards he became General Sales Manager.

He returned to the U.K. in 1958 and was made Deputy Manager, Lubricants, in 1959. He became Marketing Director of Shell Companies Argentina de Petroleo SA in Buenos Aires in 1960, and later was appointed Executive Vice-President.

In 1966, Mr. Greenborough returned to the U.K. as head of Market Systems and Operations and in 1967 became head of the Australasia and Marketing Divisions of the East and Australasia Region.

He was appointed Managing Director, Marketing, in Shell-Mex and B.P. Ltd. in March 1969, and took up his present appointment of Chief Executive on the retirement of Mr. T. R. Grieve in August 1971. He is a member of the Clean Air Council.

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# Lecture given to National Society for Clean Air on the 25th January 1973

by

**Professor M. W. Thring.**

*Queen Mary College, University of London*

## **Our attitude to Pollution**

When I was a member of the Clean Air Council fifteen years ago, public enemy No. 1 in regard to air pollution was smoke from the coal fire, both domestic and industrial; No. 2 was grit blown from coal grates especially in boilers. Now we have largely replaced coal by oil and gas which are much easier to burn without smoke, and the amount of fuel burnt in cars and lorries has risen so much that there is little doubt that the products of incomplete combustion from vehicle engines (CO and hydrocarbons from spark ignition engines and soot from diesels) are public enemy No. 1, while opinions differ as to whether SO<sub>2</sub> from coal and fuel oil combustion, or lead from car exhausts, occupies second place as poisons.\*

I shall first try to show that the fundamental axioms of the affluent society lead inevitably to a fundamentally wrong attitude to pollution and all the other problems of a thoughtlessly applied technology. Then I shall run briefly through a list of these problems to show that it is almost completely useless to tackle them locally and piecemeal because such action almost always leads either to the problems being passed on to other places or to one of the other problems becoming worse. Finally I shall try to show how we can get out of this mess.

The basic economic assumption of the affluent society is that success to a manufacturer is measured by the amount of profit. This in turn has led to three axioms. (1) Whatever possessions an individual can acquire (almost regardless of the means of acquiring them) is the criterion of his success in life. (2) Whatever he can pay for (eventually and somehow) is the criterion of what he can acquire (regardless of whether it is in short supply in the world). (3) Whatever a worker can get paid for is the sole criterion of the quality of his work, and whatever goods a factory can get paid for is the sole criterion of the quality of the product.

As a direct result of these axioms, goods are made and cars run as cheaply as possible and so no one wants to take any steps to avoid emitting a pollutant. Thus a pollutant is assumed innocent until it is proved guilty, even though it is known to be a poison when present in sufficient concentration. CO, SO<sub>2</sub> and lead compounds are all known to be poisons, but much more money is spent on research to prove that they are not causing any harm at present, than is spent on research to find out exactly how much harm they do cause. People who point out this fact are accused of emotionalism, of rocking the already unstable national economy, or of un-

scientific exaggeration; at the same time, the emission of pollutants steadily increases with the increase of the GNP while the pollutants like Pb compounds DDT and oil-sea water, steadily accumulate.

The main loopholes whereby a pollutant escapes from being branded as a danger to human health or to the ecology are—

1. The concentrations measured in the environment are usually in the range 1/10-1/100 of the value which is clearly proved to be lethal for a person working 40 hours per week in the poisonous environment. However, they have sometimes been clearly shown to rise close to this value, e.g. CO in vehicle tunnels and Pb in water in certain towns. In any case if it is even 1/100 of the concentration proved lethal for a healthy adult exposed to it only part time, it is very likely to cause definite harm to infants and old people exposed to it all the time. The evidence of Lave and Seskin<sup>1</sup> relating measured air pollution statistics for a large number of areas to bronchitis and lung cancer mortality, infant mortality and adult illness, proves conclusively that air pollution does cause damage to human health.

2. The apologists for pollutants assume that no synergistic effects occur, whereas it is highly likely that if a person's general health is damaged by exposure, especially in childhood, to one pollutant, then they will be affected by quite low concentrations of another pollutant.

3. They ignore the fact that concentrations of pollutants far below the lethal levels can cause slight headaches, general malaise and dangerous deterioration of attention in vehicle drivers and some people will be much more sensitive than others.

4. The apologists ignore the accumulation of pollutants—for example, it has been shown that Pb has been accumulating in the top layers of the sea and in the ice layers deposited on Greenland at a rate considerably greater in the 50 years since we started emitting it in car exhausts.

## **The Fifteen Problems arising from Careless Use of Technology**

These are shown in Table I. I have divided them into the four main categories.

- a. Damage to the environment—caused primarily by what we can describe as cheap engineering—emitting pollutants because it is cheaper than to contain them.

<sup>1</sup> Lave and Seskin showed for example that the bronchitis mortality in a group of boroughs would be reduced by 70 per cent if all the boroughs had the same degree of pollution as the best one.

\* By poison I mean a chemical which has been shown to cause a rise in mortality or illness when it is present in sufficient concentration.

b. Harm to the minds and bodies of people living now—primarily due to the use of engineering to do whatever the political or economic masters tell the engineer to do without his caring for the consequences—uncaring engineering.

c. Extravagant use of the world's limited resources, without heed to the needs of our descendants in the XXI Century and after. The engineers cannot afford to accept the argument that this wastefulness is justified because they will find substitutes as good.

d. The harm done to the possibility of people finding self-fulfilment through their paid work as an artist or a craftsman found it.

There are many obvious examples of the fact that taking local piecemeal legal action against one of these problems immediately makes others worse.

i. If we stop the Concorde for reasons of noise, chemical pollution and fuel extravagance, we cause increased unemployment.

ii. The U.S. action against unburnt and  $\text{NO}_x$  emissions from cars is leading to greatly increased fuel consumption, demand for platinum and larger engines.

iii. If we use pesticides (especially DDT) and chemical fertilisers in large quantities, we destroy fish life in rivers, lakes and inland seas, we destroy birds and reduce the long-term fertility of the soil.

iv. If we make a motor car that lasts 30-50 years to save raw materials, we destroy the motor industry and cause severe unemployment.

It is also true that it is in the best short-term economic interests of a country to export its pollution to another country and so reduce its production costs, e.g. French and German chemical wastes put into the Rhine cause trouble in Holland, and it seems very likely that  $\text{SO}_2$  from the power stations of Britain (where we have lime soils which are unharmed by sulphuric acid) and of Western Europe causes damage to trees and fishes in Scandinavia where the soil is granite.

One can conclude by saying that the maximisation of profit in a status-seeking society is essentially incompatible with a proper respect for the environment. We cannot solve pollution problems as long as the basic ethos is that of the affluent society.

### Who is to Blame ?

Fundamentally there are three factors blamed for pollution and destruction of the environment.

1. The rising number of people in the world.

2. The worship of possessions for their own sake—the status symbol associated with built-in obsolescence, throwaway containers, fashion changes and unnecessarily powerful fuel consuming devices.

3. The incompetence of the scientist and engineer in failing to clean the poisonous effluents from chimneys exhaust pipes, sewers and dumped solids, providing chemicals which are not organically destroyed and allowing incomplete combustion of CO hydrocarbons and soot, putting lead into petrol to ease his design problems.

A very simple formula based on dimensional analysis shows that all three factors must share the blame and all three must be controlled rigidly if man is ever to come into equilibrium with his environment.

## TABLE 1 The harmful results of technology

### GROUP 1. Damage to the environment.

- I **Air pollution.**—CO. Unburnt hydrocarbons. Soot. Pb compounds.  $\text{SO}_2$ ,  $\text{NO}_x$ , HCl, HF, HCN. Radioactive gases and dusts. CaO.
- II **Water pollution.**—Factory effluents including sulphite lye. Salts of Pb, Cd, Hg. Sewage. Fertilisers and pesticides washed from farms. Oil. Thermal pollution.
- III **Land pollution.**—Drums of poisonous waste. Litter. Slagheaps. Derelict factories. Radioactive and Pb fallout.
- IV **Noise and vibration.**—Aeroplanes. Cars and lorries. Domestic and factory machines. Mains hum.

### GROUP 2. Damage to present humanity.

- V **War machines.**—Bombs. Warplanes. ICBM. Guns. Tanks. Defoliants.
- VI **Poverty: Underdeveloped countries.**—Slums and poor farms in rich countries.
- VII **Accidents.**—Aeroplanes. Cars. Ships. Mines. Factory. Home.
- VIII **Unnatural and unhealthy life conditions, especially in cities.**—Overcrowding. Ugliness. Tasteless food. Traffic jams. Loneliness. Lack of privacy. Lack of exercise. High rise flats.

### GROUP 3. Damage to future generations.

- IX **Fossil fuel depletion.**—Oil. Natural gas. Coal. Concentrated U ore.
- X **Radioactive waste.**—From nuclear power stations. Lack of permanent safe disposal.
- XI **Metal ore depletion.**—Mesabi iron ore. Cu. Ni. Cr. Zn. Hg. Sn. W.
- XII **Misuse of land.**—Monocropping. Hedge removal. Burning stubble. Lack of humus-making fertilisers. Concrete and asphalt. Compaction by heavy machinery.
- XIII **Misuse of fresh water.**—Artesian wells lowering water level. Dams that fill with silt. Water waste in cooling towers. Lavatories etc.

### GROUP 4. Human paid work.

- XIV **Underemployment of talents.**—Disappearance of craftsmanship. Machine feeding and machine mind-ing. Assembly belt work. No connection with quality of product.
- XV **Unemployment.**—Caused by productivity rise above point where it can be absorbed by living standard rise.

$$C_t \propto N/A \cdot G_{c+w} \cdot t_h \cdot 1/E_1$$

where  $C_t$  = mass concentration of a pollutant in the environment

$N$  = number of people living in a self polluting area  $A$

$G_{c+w}$  = goods consumed and wasted (including war) per head per annum

$t_h$  = half life of the pollutant in the environment

$E_1$  = engineering efficiency in preventing emission expressed as tons of equivalent coal actually burnt to produce the products  $G_{c+w}$  per kg of pollutant emitted.

We can also write

$$G_{c+w} \propto P = P_0/n_1$$

where  $P$  is the tons of coal actually burnt to produce  $G_{c+w}$ ,  $P_0$  is the tons theoretically required and  $n_1$  is the energy efficiency for which the engineer is also responsible.

Any reduction in  $N$  can only be long term, so that the urgent task is for the engineer to increase  $E_1$  and  $n_1$ . Even if the 1/4 million engineers in Britain can do all the necessary research and spend the necessary money on capital expenditure, they can only hope to increase the product  $E_1 n_1$  by a factor in most cases of less than 10 times and this will require a heavy drain on raw materials which makes the resource problem more acute. When we consider that  $G_{c+w}$  for the developed countries is some four or five times the world average, so that 2/3 of the world is using only a fraction of the world average, it becomes clear that man can only solve the world-wide pollution and resource problems if the rich countries accept that their standard of living must fall to about the world average. Otherwise we shall simply have the undeveloped countries saying 'you are hypocrites asking us not to pollute when you are enjoying such a rich life' as they said at the Stockholm Conference.

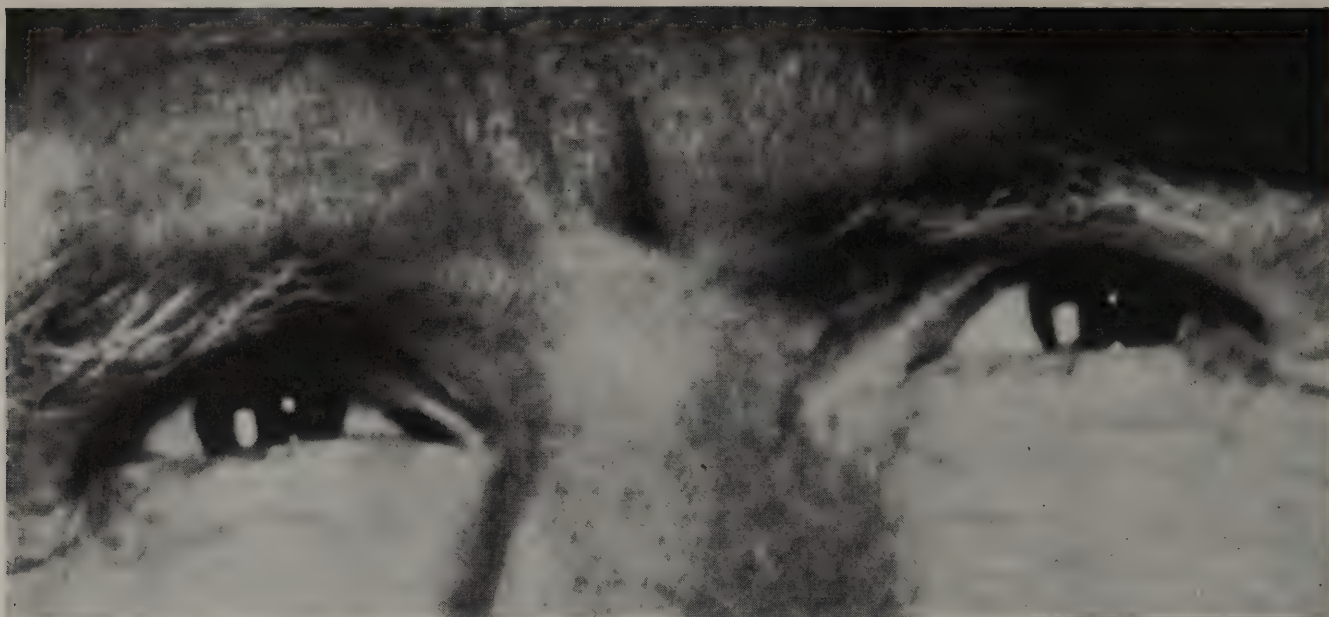
#### A New Look at the Problem: The Creative Society

It is no use trying to extrapolate growth curves forward because it is quite impossible to predict whether the curve will go on doubling every 10, 20 or 30 years for several doubling periods or, whether it will level off quite soon.

As someone has put it so accurately, if you measure the daily growth of a tadpole, you can predict an elephant. I therefore suggest that the only way out of our present dilemma is to work out the necessary conditions for a decent life for all the people who will exist in the world in the XXI Century, and then we have a map of a feasible future instead of blundering from one problem to another as we do at present. A full description of my ideas for a machine-slaved Utopia called the Creative Society is given in my book 'Man, Machines and Tomorrow'. It is based on the idea that people really prefer to measure their success in life by the quality of their life rather than their standard of living or accumulation of status symbols. Their quality of life is their realization of their possibilities through creative achievements. In such a society all the 15 problems have been solved, but at the expense of sacrificing all our luxurious toys because the world cannot provide these for all people. There is little doubt that the world resources may provide a standard of living fully adequate in all respects and with no pollution and permanent steady state equilibrium between man and his environment and a world population of 7,000 million, but only if everyone is prepared to be satisfied with this standard of living and cease to strive for more. Thus the Creative Society would be a world of mediocrity in terms of standard of living, but the sky would be the limit as far as quality of life was concerned.

#### Conclusions

Pollution—exhaustion of resources, accidents, unemployment and all the other problems of the Affluent Society can only be solved permanently by changing the goals of society from status symbols to quality of life. We must decide the necessary conditions of an equilibrium society before we take piecemeal action of a legal or economic character to solve one problem in isolation. We must try to solve the engineering aspect of an emission of a pollutant, but we must also make other problems better at the same time, not worse, as in the American car pollution which leads to 20 per cent increased fuel consumption. We must consider the effects of any changes we make on the whole of mankind, especially the undeveloped countries and we must consider the effects on future generations.



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# CLEAN AIR AND YORK

David Goodall, Bryan Gray and Robert Smith\*

How many people know about the Clean Air Act? The Act was passed in 1956, and was designed to transform towns and cities throughout the British Isles into healthier and cleaner places to live. We don't hear about London smogs any more, because the smog formed only when acrid, sooty smoke poured out of London's chimneys. Soot comes from burning coal. Since 1958 Londoners have been progressively going over to using smokeless heating—solid smokeless fuel, gas, electricity, or oil—with the aid of grants from the Greater London Council and the Government. A 1970 report showed that not only have smog and smoke disappeared in London, but that people suffering from bronchitis and chest complaints have substantially benefited from the cleaning up of the air. The amount of sunshine seen by Londoners in December has almost doubled since 1958. Birds obviously enjoy clean air too—the number of species visiting or resident in London has also doubled in the same period.

What has all this got to do with York? Like London, we are a city—admittedly a small one—and we also are using the Clean Air Act as a basis for cleaning up our atmosphere. Unlike London, we have been slow to get a programme going, and York's first Smoke Control Order became mandatory only in 1970.

We men are often tempted to think that, because York is a small city with hardly any heavy industry, the air here must be far cleaner than it is in a place like London. Our wives generally know better: it is their washing that gets dirty on the line, and they who have to clean the smuts off the paintwork.

The Government Laboratory at Warren Springs has been co-ordinating a survey to check on air pollution throughout the country. An analysis of these results, reported in this paper in October 1971, showed that York came 37th out of 40 in one table of smokey towns. It seems strange that we devote a lot of energy and money to cleaning and repainting the historic buildings in the city centre, yet are laggardly in attacking the smoke which is the cause of the problem.

We also doubt whether York air is healthier than London air, as statistics show that bronchitis causes a higher proportion of lost working days in North Yorkshire and the North East than anywhere else in Great Britain.

Some of you might be protesting that the problem is now in hand. After all, York City Council have already made four Smoke Control Orders and an area covering 6,000 houses in Dringhouses is to become smokeless by 1st July 1974. In fact the Health Department has converted approximately 2,000 houses per year to smokeless fuel over the last three years. Knowing that there are 37,000 houses in York, we deduce that at the present rate it would take till 1990 for York to become fully

smokeless! This would be twelve years behind London, and eighteen years behind Sheffield. To our way of thinking, York is lagging sadly behind the rest of the country.

Incidentally, York could have become fully smokeless by 1971, had a plan considered by the City Council in 1961 been approved. During the 1960s the Council repeatedly rejected the plans of its Health Committee to institute Smoke Control Areas.

In February we organised a survey to find how York householders felt about going smokeless. 260 households were sampled, of which 90 were from the area within the Bar walls (which has been smokeless for two years) and the remainder from areas which are not covered by a Smoke Control Order. Over 70 per cent of those questioned thought conversion to clean air was beneficial. More than 50 per cent of the people felt that the Council should act urgently to make York smokeless, and only 19 per cent were of the opinion that the Council should not bother. These figures certainly suggest that the Council will have the support of the public in creating new clean air districts as swiftly as is practicable.

One very striking feature revealed by our survey was the movement away from coal. 86 per cent of the householders questioned in the area which went smokeless between 1968 and 1971 burned coal before conversion to smokeless fuel. In the other parts of the city only 50 per cent of the householders questioned are currently using coal fires.

This trend was discussed in evidence given last year to the Clean Air Council by representatives from the "black" authorities of the North East. Between 20 per cent and 40 per cent of owner occupiers are making their own private arrangements for conversion to smokeless fuel.

The implication, as Chairman of the Panel of the Clean Air Council pointed out, is that "councils are relying on private enterprise to enable them to accomplish smoke control on the cheap, while denying the ratepayers the benefit of grant". No wonder people complain when they find that their area is not scheduled to go smokeless for a number of years! If they lived in a controlled area they could be eligible for a grant of £50 or more towards their conversion (£20 from the council, £30 from the government). So all those here who make private arrangements for conversion are subsidising their fellow ratepayers in York, and their fellow taxpayers in areas like London and Sheffield where smoke control programmes are almost complete.

The Chief Public Health Inspector for York has informed us that within the next few months an overall plan for smoke control in York will be drafted. Needless to say, he would like to see York go smokeless as a matter of urgency. We hope that the Council will give

his programme a high priority when they come to allocate their budget. Given the will, we see no reason why York should not even catch up with London and complete all conversions by 1978.

Well, which is it to be—1978 or 1990? The choice, basically, is yours. We have made our point in this article, and we would like you to echo this with your Councillors if you are in agreement.

The conclusions of this article apply also to the new North Yorkshire Authority. In the recent County Council elections, a campaign manifesto promised that Con-

servatives care about the quality of the air. We see no evidence of this at present, since we cannot find any areas in North Yorkshire outside of York which have been converted to smokeless fuel with the aid of Clean Air Grants.

We look forward to some swift action on air pollution in other parts of North Yorkshire as well as in York. After all, it is 17 years since the Clean Air Act was passed!

\* *Members of the Science, Government and Society discussion group involving staff and students of the Chemistry Department, York University.*

## Symposium on Progress in the Incineration of Industrial and Domestic Waste

The Institute of Fuel, London and Home Counties Section, are holding a one day Symposium on Tuesday 25th September 1973 on Progress in the Incineration of Industrial and Domestic Waste. The Symposium will be held at the Mount Royal Hotel, London. Further details are available from: The Institute of Fuel, 18 Devonshire Street, London WIN 2AU.

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# Envitec '73 — Dusseldorf

## 8 - 14 October

The National Society for Clean Air, in conjunction with the Department of Trade and Industry, is organising a British Joint Venture Stand at Envitec '73, an International Exhibition on Environmental Technology.

The Exhibition will cover some 19,000 square metres in Halls 7, 8 and 9 at the Dusseldorf Trade Fair Grounds in Germany. Together with an Information Stand, which will be manned by staff from the Society, there are 12 firms and organisations exhibiting their products and services.

**Airflow Developments Ltd.** of High Wycombe will be exhibiting their range of smoke monitoring and dust sampling equipment.

The SEROP is suitable for monitoring smoke and fine dust from most types of industrial plant where the measuring point temperature is below 200°C. SEROP can be an invaluable aid for monitoring pollution and improving plant efficiency. SEROP was developed in conjunction with the Central Electricity Generating Board and is manufactured under licence.

BCURA dust sampling equipment is based on a design developed by the British Coal Utilisation Research Association. The complete equipment occupies little space in transit and storage and is suitable for most types of gravimetric sampling.

The Airflow MKIIIA flue gas dust sampling equipment takes advantage of the latest 25mm flow metering orifice assembly. This has enabled the equipment to be more compact and by the use of a polypropylene tube and components manufactured in similar material the total weight of the equipment is now no more than 8.5kg.

CEGRIT automatic dust sampler is a development from an original design by the C.E.G.B. for the continuous sampling of gas-borne dust in boiler flues. Airflow Developments now manufacture under licence an improved version of the C.E.G.B. device for use on all combustion or other processes where it is desirable to maintain a watch on dust burden and where there is a flue suction of not more than 25mm H<sub>2</sub>O. The equipment is small and inexpensive, easy to install and has a long life as there are no moving parts.

Reader Enquiry Service No. 7354

After some 18 years of operative experience, the Airmaster 50/700 Series Package Unit manufactured by **Airmaster Engineering Ltd** of Leeds is a standard throughout all industries in most of the world and the models have hand-operated or electric shaking mechanism. The range varies from 50sq ft, to 700 sq ft, with fan capacities from 600 cfm, to 8,000 cfm, giving numerous combinations to suit all needs.

The most recent development has been to design a completely new range of dust extraction filter units utilising a reverse flow jet for the cleaning cycle, thus ensuring that the filter resistance is kept as static as possible and producing a fully automatic fabric filter. The RJ Unit is available in a modular construction and gives filter areas from 165sq ft, upwards. A unique method of obtaining maximum filtration area within a minimum of space has been utilised in the filter design and a cutaway exhibition model (silo-venting type) showing the integral parts of the unit will be on display.

In order to meet the ever-constant demand for larger filter plants occupying smaller floor areas and requiring

lower capital outlay, Airmaster have developed the new RJI range of reverse jet filter units. This range, with a nominal maximum of 4,000ft<sup>2</sup> of pneumatically shaken filter cloth, can reduce the floor area required by up to 33 per cent and can reduce the capital outlay by up to 20 per cent, when compared with other reverse air flow filter plants.

Reader Enquiry Service No. 7355

**Alldays, Peacock & Co. Ltd.** will feature the recently developed EUROPA range of fans designed throughout to ISO units and dimensions and based on an extensive knowledge of fan engineering gained in over 70 years of experience.

The EUROPA range of fans is just one part of this company's very wide range, which stretches across the whole field of fan applications and embraces all aspects of incineration, gas cleaning and atmospheric pollution.

Fans for process plants of every description have been supplied and constructed to high standards including radial bladed units in special steels for use in hot gases to 1,000°C.

A robust paddle bladed fan (PB) is included in the EUROPA range, as are also backward Lamina (BL), backward Aerofoil for the highest efficiencies (BA) and multivane (MV), all of which will be represented. This range is available in impeller sizes up to 2,500mm diameter.

APCO are well known for centrifugal gas boosters of both single and double stage type for use with natural or manufactured gases and an important exhibit will be the QT gas booster fan specifically designed to boost pressures up to around 590mm on a single stage.

Reader Enquiry Service No. 7356

**Fleming Instruments Ltd.** of Stevenage have for many years been designers and manufacturers of environmental monitoring apparatus will be showing instruments for the collection and measurement of Particle Size, Particle Concentrations, Hydrogen Sulphide Gas and Ultra-Violet Radiation.

The instruments which will be displayed are:

1. Air sampling instruments such as the 544 Particle Sampling Unit—a battery-operated transportable air sampler for collection of particles for subsequent analysis: the Air Pollution Monitor Type 505A for the continuous monitoring of airborne particulates and an Aerosol Spectrometer Type 501 for long term (8-20 hours) collection and aerodynamic sizing of airborne particles.
2. The Particle Size Micrometer and Analyser Type 526 for the optical sizing and counting of particles (1 micrometre-250 micrometre) collected on microscope slides or membrane filters.
3. The H<sub>2</sub>S Monitor Type 533A used for the continuous personnel monitoring of H<sub>2</sub>S gas in air. This instrument continuously evaluates the gas concentration and gives audible and visual warnings if the level exceeds 10ppm for five minutes.
4. U.V. Radiation. The 'Fleming' U.V. Sensors (315mm, 350mm and 400mm) and Three-Channel Count Intergrating and Recording System will be demonstrated. Long term, accurate measurement of total U.V. dosage and incremental information is recorded in print form. This apparatus is of particular value for research into the effects of

U.V. radiation on plastics, paints, plants and human skin.

Reader Enquiry Service No. 7357

**Hygrotherm Engineering Ltd.** of Manchester offer economical and completely effective disposal of fume and liquid pollutants by direct incineration.

Hygrotherm-Hirt Incinerators are built to designs which have been proved successful in over 300 installations in the USA and Europe, meeting the most stringent pollution control regulations safely and at low operating costs.

The Hirt burner which consists of a number of ceramic tubes can be built up to form a square or rectangle of a size to match the required capacity. Each tube operates independently and can have passing through it combustion air, fume or fuel gas. Fuel oil or liquid effluent is introduced through a separate burner. Combustion air or fume enters a plenum chamber and is diverted either through the burner tubes as primary air or between the ignition tube and inlet orifice as secondary air where efficient mixing and maximum flame exposure occur. No further combustion air is required and the arrangement can result in fuel saving of as much as 30 per cent.

Hygrotherm are currently active in the supply of incinerators to companies in Britain, Holland, France, Germany and the Soviet Union. Incinerators are available for liquid or gaseous effluent destruction, the most popular being a unit for the incineration of coke-oven off-gases (consisting mainly of ammonia).

Special Hygrotherm designs are available using heat recovery, so reducing fuel costs considerably. Shell and tube heat exchangers are employed for fume pre-heating, steam raising or oil heating for process use, sometimes halving fuel costs.

Reader Enquiry Service No. 7358

**Intellogic Limited** of Hove, Sussex, have for many years been supplying their remote-control equipment to Water Boards and Sewerage Works. On display will be just one part of their extensive range of monitoring systems—the Datofonic Mark IIIe.

The Mark IIIe operates over the national telephone network, and will make an automatic call to a remote-control room immediately an alarm occurs in the monitored plant. The system will also give this information to the Control Room Engineer should he make a call into the remote unit. The unit will also make a

number of attempts to contact the Control Room should the initial call be unsuccessful, due to an engaged telephone circuit.

This particular unit incorporates control facilities whereby the Control Room Engineer can instruct the remote Datofonic unit to activate a pump or circuit breaker.

Intellogic systems are not confined exclusively to operation over the telephone network. The Series IV, a continual scanning system, is a simple, reliable, low cost yet extremely powerful and flexible telemetry and remote-control system, which is capable of linking up to 63 complex remote stations to a central control by means of a single speech quality cable or radio channel.

Reader Enquiry Service No. 7391

The **Lodge-Cottrell** stand will present a visual display of services to industry offered by the company and its subsidiaries in the field of gas cleaning and dust collection plant for the control of emissions of solids to the atmosphere.

Lodge-Cottrell Ltd., based in Birmingham, is primarily involved in the Iron and Steel, Cement, Power Generation and Municipal Refuse Incineration fields where permissible emissions of dust in waste gases are strictly limited by legislation to very closely prescribed limits.

In the Iron and Steel Industry, the equipment is applied to ore unloaders, stockyards, stockhouses, sinter strands, pelletising plants, blast furnaces, converters, B.O.S. plants, arc furnaces, ladle transfer points and scarfing machines.

Cement production demands dust suppression in the discharge gases from the kilns and clinker coolers as well as from the grinding mills and transfer systems.

The variety of materials handled in modern municipal refuse incineration plants create gas cleaning problems requiring special consideration bearing in mind their normal close proximity to heavy density residential areas.

In power generation the majority of installations in recent years in European countries have utilised energy from nuclear and oil sources but coal-fired stations are still operating in many parts of the world and require cleaning plants for removal of particulate matter from the flue gases.

Lodge-Cottrell design, supply, erect and commission complete gas-cleaning installations, together with any associated dust handling pelletising or water-treatment plants for all these applications.

Reader Enquiry Service No. 7359

**Düsseldorf 8th.-14th. October 1973**

# ENVITEC '73

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Information: John Buck (Trade Fair Agencies) Ltd., 44, Newman Street, London W1. Tel. 01-336 9325

The London-based **Metro-Flex Group** specialise in solving problems calling for gas-tight isolation. Metro-Flex isolators are available for flue and duct sizes from less than 0.05m<sup>2</sup> to more than 100m<sup>2</sup> and for temperatures up to 1000°C. All the valves use advanced techniques of gas-tight sealing by means of austenitic steel flexible sealing elements ensuring a very high degree of tightness, 99.8 per cent to 100 per cent, on cross-sectional area, depending on type.

On display is their latest version of Simplex Isolator. Valves similar to this, for pressures up to 2,000mm W.C., have recently been supplied for primary air isolation at Longannet, Rugeley, Tilbury B and West Burton Power Stations in the United Kingdom and for SO<sub>2</sub> scrubber isolation at Cherokee and Mohave Power Stations in the United States. The casing of the valve shown has been specially strengthened to enable the unit, in the open position, to withstand explosive pressures up to 3.5 atmospheres.

This latest Simplex Isolator enables possible safe and easy maintenance of pulverised fuel mills while the boiler itself remains on-load. Similarly, Metro-Flex Duplex and Glandular Spade Valves, of which details will be available on the stand, are used to isolate precipitators and Fans at steelworks, cement and power stations where the growth in unit size and unit production capacity, coupled with increasingly stringent pollution regulations, make the need for safe on-load maintenance an economic essential.

Reader Enquiry Service No. 7361

An extensive range of fabrics will be exhibited by **P. & S. Textiles Ltd.** of Rossendale consisting of continuous filament, staple fibre and monofilament cloths which have been designed particularly for use on equipment involved in the reduction of environmental pollution. Made-up articles for dust collection equipment will also be on show, manufactured from all synthetic fibres including Fibreglass, Nomex and Teflon and specialised articles for wet filtration will include "Neotex" and "Propex" constructions. Needled felt materials, which provide 99.9 per cent efficiency on dust collection where the particle size can be 70 per cent less than one micron, will be available for examination, together with used fabrics with case histories showing their condition after extensive usage.

Research Department equipment for test work in the investigation of user problems, i.e. the selection of cloths for dry filtration, is shown as a working unit. This equipment which has been designed by our company, is a registered design and has been shown for the first time at the Achema Exhibition in Frankfurt in June. The apparatus enables our technicians to duplicate plant conditions and information is provided from the tests carried out, which enables the recommendation of the most suitable fabric to be made.

Reader Enquiry Service No. 7362

The Environmental System Division of **Redman Heenan** of Worcester will present their total capability, concentrating on smokeless incineration.

Seventy years of experience backs Redman Heenan's leadership in the field of pollution-free waste disposal. This encompasses all aspects of Environmental Engineering including the control of air and water pollution.

Redman Heenan design and supply sophisticated equipment for the disposal of notoriously difficult materials including sewage, pathological, biological and animal wastes, tyres, plastics, oils, chemicals, toxic liquids, solids and sludges. These wastes are disposed

of economically without hazard to the environment and meet the most stringent international pollution legislations.

Redman Heenan use the most appropriate technology in the design of each particular system which is supported by extensive professional technical resources.

Redman Heenan will demonstrate:

1. Refuse incineration by continuous mechanical grate in combination with sewage sludge.
2. Smokeless tyre burning at 1600°C.
3. Sludge incineration using fluid bed technology.
4. Liquid and solid waste cyclonic furnaces.

Redman Heenan's systems 'know how' extends into mechanical handling, gas cleaning, effluent treatment, metal recovery and automatic control.

Reader Enquiry Service No. 7363

The **Safety in Mines Research Establishment (SMRE)**, Department of Trade and Industry, based in Sheffield, carries out research on all major aspects of safety in coal mines, and on a smaller range of non-mining problems. Techniques devised at SMRE for monitoring the mining environment are applicable over a much wider field to help in the fight against atmospheric pollution.

An important part of SMRE's research is concerned with gas detection. Transducers have been developed that can measure pollutant gases in concentrations below the maximum limits recommended for industrial exposure. Three gas-measuring techniques will be featured:

1. A sensing element has been devised that relies on the changes in electrical conductivity that are produced in a semiconductor metal oxide when a gas reacts on its surface. Portable instruments based on the element are being developed for measuring carbon monoxide and methane and these instruments are on view.
2. A metallized-membrane electrode has been devised for use in a polarographic cell, and is being developed with a view to measuring carbon monoxide and nitrogen oxides. The exhibit is a prototype fixed-installation monitor that achieves selectivity by pumping the polluted air through selective reagent layers, but work is proceeding on sensors with greater intrinsic selectivity.
3. A study is being made to determine whether sulphur dioxide can be measured by making use of the inhibiting effect it has on a catalytic reaction, and an experimental arrangement is on view.

Also on view will be an SMRE prototype instrument that measures the concentration of respirable airborne dust by making use of the light-scattering properties of the dust particles. Instruments of this type have the advantage that they can give instantaneous readings, but the new instrument has the additional advantage that the readings are independent of the dust composition. The instrument is self-contained, and can operate for up to 10 hours on a set of rechargeable batteries.

Reader Enquiry Service No. 7364

The **Warren Spring Laboratory**, Department of Trade and Industry of Stevenage is devoting increasing effort to various aspects of pollution—in the air, on the sea and beaches, and on the land.

**SCRAP AND WASTE.** Chemical processing routes are being developed for the recovery of metals from metallurgical wastes such as complex alloy scrap, slags, spent catalysts, and contaminated process waters. Methods and equipment for physical sorting of waste materials are being developed, and the examination of thermal processing routes made. A main concern is the pyrolysis of domestic refuse, scrap rubber, and plastics waste.

**SURVEILLANCE OF AIR POLLUTION.** The National Survey of Smoke and Sulphur Dioxide has now covered a decade, and continuous sampling is carried out by local authorities and others at some 1,200 sites. The daily measurements are analysed by WSL, which co-ordinates the survey and disseminates the results.

**ENVIRONMENTAL PLANNING AND PREDICTION.** WSL studies various aspects of dispersion, including the dispersion of chimney gases in relation to configuration of surrounding buildings, patterns of horizontal and vertical dispersion throughout built-up areas, and the siting of large emitters in relation to housing.

**ABATEMENT OF POLLUTION.** Studies are being made of devices and techniques for directly abating the emission of lead and other pollutants from petrol-driven

vehicles. Methods of reducing offensive industrial odours are also being examined.

**POLLUTION OF THE SEA AND BEACHES.** WSL provides the necessary technical and scientific backing and co-ordinates government research in the whole area of oil-spill technology, including booms, burning, the drift, and movement of oil, removal of oil from the sea surface, and the identification of oils. The WSL programmes includes the assessment of dispersants, absorbing agents, and systems for oil recovery at sea, the development of mechanical beach-cleaning devices, and techniques for the efficient use of solvent emulsifiers at sea.

Reader Enquiry Service No. 7365

## Fuel. . . Conservation or Crisis ?

The Combustion Engineering Association are holding a conference on Fuel . . . Conservation or Crisis? from 31st October to 1st November 1973 at the Royal Bath Hotel, Bournemouth. Further details are available from: The Combustion Engineering Association, Beaufort Chambers, 240b High Street, Slough, Bucks. Tel: Slough 33211.

## Retirement of Mr A.C. Saword.

Mr. Saword who recently retired first made contact with the Society in 1944 when he presented a paper entitled "Clean Air and Practical Politics" at a sessional meeting of the Royal Society of Health at Bolton. Among the audience were Mr. Charles Gandy (Chairman) and Mr. Arnold Marsh (Secretary) of the then National Smoke Abatement Society, and after the meeting he had a long personal discussion with both. After the war, when the Society was being reorganised, Mr. Saword was elected Chairman of the Provisional Committee which drafted the Constitution of the Yorkshire Division and he remained a member of the Divisional Council from then until 1973—a fairly long innings even for Yorkshire! Mr. Saword was Chairman from 1956 to 1969, and during the last two or three years was Chairman of the Executive Council of the Society. His work within the Society, together with that in the Royal Society of Health (examiner and member of Sub-committee for Air Pollution Control Examinations) and the Association of Public Health Inspectors (Representative on Working Party for Odour Control) have kept him well occupied in this subject which has always held a special interest for him. Mr. Saword says he shall miss the opportunity for actively working in this field but he will continue as an individual member, to support the work of the Society.



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Reader Enquiry Service No. 7366

# THE COST OF REMOVING LEAD FROM PETROL

The cost of producing lead-free petrol was estimated in a thesis submitted for the Part II Chemistry Examination at Oxford University.<sup>1</sup> This cost was estimated by comparing the running and capital costs of two refineries, one producing leaded petrol in the quantities, and with the specifications of present-day U.K. petrol, and the other producing the same quantities of lead-free petrol. Both imaginary refineries were producing petrols of 91, 95, 99 and 101 research octane.

## Increase in petrol cost of under 1p/gallon

To produce lead-free petrol a more complex refinery configuration was required. The most economical solution was evaluated. The changes in process unit capacities required are shown in table 1.

TABLE 1  
Relevant process unit capacities (relative).  
(Atmospheric distillation capacity in the  
leaded refinery equals 100 by weight).

Process unit	Leaded refinery	Lead-free refinery
Atmospheric distillation	100	103
Vacuum distillation	14.4	15.9
Catalytic cracking	10.4	10.4
Hydrocracking	0	1.11
Distillate hydrotreating	19.4	20.0
Catalytic reformer	6.5	5.6
High severity catalytic reformer	0	3.96
Isomerisation	0	2.52
Extraction of branched isomers, e.g. Iso-Siv	0	2.47
Dimerisation of propylene from cracker, e.g. Dimersol	0	0.46

To produce lead-free petrol, the throughput of the refinery must be increased by 3 per cent by weight. The U.K. capital cost of increasing the capacity of some of the refinery process units and of introducing the new process units required for lead-free petrol production was found to be approximately £180 million. This corresponds to an increase in fixed asset capital of about 20 per cent. These increases in the capital and crude requirements combined with the fact that the running costs of the lead-free refinery were over 10 per cent greater than those of the leaded refinery, resulted in an increase in petrol cost of 0.89p/U.K. gallon (at April 1973 prices for crude and petroleum products). This average increase in petrol costs might be weighted towards the higher octane petrols to which, at present, the most lead is added. It was found that the production of lead-free petrol would require an increase in the aromatic content of petrol of about 60 per cent. Many aromatics are poisonous and carcinogenic and they burn with a 'smokey' flame. This latter property leads to large particulate emission and engine pre-ignition.

## Change to TML could reduce lead emissions by half. (TML is tetramethyl lead).

The question which must be answered is whether or not the removal of lead is justified. At a time when the world is realising that we may use up the total petroleum reserves of this planet before the end of this

century, unless we reduce our consumption, it is disturbing that governments are being persuaded to reduce the lead content of petrol and so to increase crude oil consumption. Obviously the extra crude oil required to produce lead-free petrol is not entirely wasted, but rather the more complex processing required to produce lead-free petrol results in an increase in petroleum gas (C<sub>1</sub>-C<sub>4</sub>) production of 12 per cent, an increase in middle distillate production of 5.6 per cent and an increase in heavy materials production of 1 per cent. These petroleum gases are competing as energy sources with natural and town gas and with electricity and coal. Thus lead-free petrol production would result in the production of gases for which we have non-petroleum derived substitutes, and so waste crude oil which is needed for the production of plastics, petrochemicals and transport fuels.

It has been argued that we should produce lead-free petrols by not adding lead to the petrols produced now. This would result in the production of low octane petrols only suitable for Wankel engines and low compression piston engines. Both of these types of engine are characterised by high fuel consumption compared with the high compression piston engines now in use. Again crude oil would be wasted.

The search for non-toxic anti-knock agents to replace TEL (tetraethyl lead) continues, but all anti-knock agents which have been discovered so far are unsuitable due to cost (e.g. methyl cyclopentadienyl manganese tricarbonyl) or to effects on engine wear (e.g. iron pentacarbonyl).<sup>5</sup> However, TML could be used as an anti-knock, thereby reducing lead levels by about half, if a modern octane number was developed. The research octane number used at present bears little relationship to the road octane number of petrol in real cars. On the research octane number scale, TML is only slightly more effective than TEL, but a B.P. study undertaken on real motor cars (not one-cylinder antiques which are used to evaluate the research octane number) shows that in real motor cars TML is much more effective than TEL. TML is only 20 per cent more expensive than TEL and so its introduction, in conjunction with a new octane number, could reduce lead emissions and reduce the cost of petrol by about 0.4p/gallon.

The evidence for the harmful effects of lead in petrol has been discussed on numerous occasions.<sup>2,3,4</sup> Three facts illustrate my opinion on the subject. The first is that the highest lead levels are found in the population of New Guinea, where there are few cars.<sup>4</sup> The second is the fact that the average airborne lead level in Cincinnati in 1966 was one-third of that in 1946, even though the number of cars had increased by 200 per cent.<sup>4</sup> (The lead content of the petrol used by those cars had also increased). Also the U.S. Health Education and Welfare Department has been unable to find any significant change in human lead levels in the last 30 years in spite of improved methods of analysis. It concludes that less than 10 per cent of human lead intake comes from the air we breathe.<sup>2</sup>

Lead poisons platinum, and so lead-free petrol is necessary if platinum based catalysts are to be used to reduce exhaust emissions. However, there is a definite

move away from these platinum afterburners because of their cost and detrimental effect on fuel economy. In fact the whole U.S. government movement towards unnecessarily strict emission laws is disintegrating due to the energy crisis. This is illustrated by their retreat on the control of nitrogen oxide pollution by cars. It is possible that only those unfortunate car manufacturers who have ordered large quantities of platinum will be using the afterburner. The most desirable solution to the problem of general exhaust emissions is a change in engine design (via devices such as the Vapipe and the Honda-type cylinder head) which will not only cut down emissions but also reduce fuel consumption by more efficient fuel burning.

### Conclusion

The author suggests that the U.K. government should introduce legislation to reduce the TEL content of petrol, and to devise a new road octane number so that TML can replace TEL and become the sole lead anti-knock

used in U.K. petrol. The introduction of TML would lead to a decrease in lead emissions without increasing crude oil consumption. Furthermore, unnecessarily strict general exhaust emission laws, like those of the U.S., should be relaxed to allow time for the development and introduction of such emission devices as the Vapipe which decrease fuel consumption.

### References

- 1 The Cost of Removing Lead from Petrol, a thesis submitted for the Part II, Chemistry by F. D. Porter, B.A., in June 1973. The thesis was submitted under the supervision of R. B. Peacock, M.A. (Oxon).
- 2 C. L. Goodacre, C.Eng., M.I.Mech.E., M.S.A.E., F.Inst.Pet., 'Lead in Petrol: is it necessary?' a paper presented to the National Society for Clean Air, 3rd April, 1973.
- 3 Professor D. Bryce-Smith, 'Lead pollution from petrol' Chemistry in Britain, 1971, vol. 7, p. 284.
- 4 A. L. Mills, Chemistry in Britain, 1971, p. 160.
- 5 Advances in Petroleum Chemistry and Refining, vol. 10, p. 456.

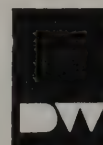
## AIR POLLUTION ABSTRACTS

**1296 Air Pollution Research Needs: Herbaceous and Ornamental Plants and Agriculturally Generated Pollutants.** Heck, W. W., Taylor, O. C., and Heggstad, H. E. (J. Air Poll. Cont. Assoc. 23 (IV)). This paper stresses the need for more conclusive research. Effects of various air pollutants on economically important crops and ornamental plants have been studied since before the turn of the century. Summaries of this research should be reviewed with respect to differences in plant susceptibility found in various regions of the country. These susceptibility differences are associated with variations in both environmental conditions and distribution of pollutants. Research efforts on air pollution injury to vegetation have often been poorly co-ordinated, leaving many gaps in our knowledge. A better assessment of the impact of air pollution on vegetation is required to attain realistic controls for pollutants affecting agriculture. Research areas of major concern include: baseline information on effects of pollutants on agricultural productivity; dose-response information to support predictive mathematical models for acute and chronic studies of growth, yield and quality effects; effects of pollutants interacting with other pollutants and with insects and plant diseases; mechanism of pollutant action; genetic changes to pollutant effects; effects of environmental stresses on plant response to pollutants; evaluation of plants including soil microbes as pollutant sinks; development of techniques to minimize pollutant effects; and the effects of agricultural chemicals as air pollutants. There is a need for studies that consider the whole plant in its natural environment.

**1297 A Simplified Technique Used to Evaluate Atmospheric Dispersion of Emissions From Large Power Plants.** Montgomery, T. H., Norris, W. B., Carpenter, S. B., and Thomas, F. W. (J. Air Poll. Cont. Assoc. 23(V)). This paper introduces a simplified method which is used by the Tennessee Valley Authority to estimate ambient concentrations of atmospheric emissions from its large power plants. The technique requires the use of three nomograms for the rapid graphic solution of three dispersion models—coning, inversion break-up, and trapping. A discussion of the meteorological conditions that are associated with these dispersion models, supporting appendices, and a worked example are also presented.

**1298 Mosses: Sensitive Indicators of Airborne Mercury Pollution.** Huckabee, J. W. (Atmospheric Environment, July 1973). Samples of fly ash, mosses and other vegetation were collected at varying distances from fly ash sources and analyzed for mercury content in order to determine the applicability of mosses as sensitive monitors of airborne mercury pollution. Fly ash exposed to rainwater collected 2 km from a power plant smokestack had a mean mercury concentration of 0.98 ppm. Based on this value and the annual rate of dry fall, input of mercury to the area was calculated. Mosses had significantly higher mercury concentrations than other plants collected at the same location. The mercury content of mosses appeared to be a function of the distance from the smokestacks, ranging from 1.13 ppm in polluted

areas to 0.066 ppm in remote areas (mean values). Experiments with radioactive mercury-tagged fly ash showed that mosses take up and retain mercury to a greater extent than do grasses.



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**1299 Control Techniques for Asbestos Pollutants.** U.S. Environmental Protection Agency. This document contains information about the nature and control of a hazardous air pollutant—*asbestos*. The primary purpose of this document is to provide information useful to those involved in the control of emissions of *asbestos* from industrial sources. The language and approach are largely technical, but the first two sections should be of interest and value to the general reader. Contents include: background information, definitions, physical, chemical and mineralogical properties of *asbestos*, origins and uses, characterisation of emission forms, major sources of emission, mining and milling of *asbestos*, manufacture of products containing *asbestos*, disposal of *asbestos* waste materials and costs of control.

**1300 Control Techniques for Beryllium Air Pollutants.** U.S. Environmental Protection Agency. Information about the nature and control of

*beryllium* as an air pollutant are contained in this paper, and although the language is largely technical the first two sections should be of interest to the general reader. Included are chapters on background information, definitions, the physical and chemical properties of *beryllium*, origins and uses, major sources of emission, *beryllium* extraction plants, manufacture, methods of waste disposal and the costs of *beryllium* emission control.

**1301 Control Techniques for Mercury Emissions from Extraction and Chlor-Alkali Plants.** U.S. Environmental Protection Agency. The information contained in this document is intended to give an appraisal of emission control methods, techniques and processes currently being used in or potentially adaptable to primary mercury extraction plants and mercury-cell chlor alkali plants.

**1302 Capacity of Ferric Oxide Particles to Oxidize Sulphur Dioxide in Air.** Chun, Kyong C., and Quon, James E. (Environmental Science & Technology, June 1973). The heterogeneous oxidation of sulphur dioxide in air by ferric oxide particles, generated by combustion of iron pentacarbonyl, was investigated, using a Teflon-lined filter-reactor. For the experimental conditions used, the reaction is kinetic controlled. The capacity of ferric oxide particles to oxidize sulphur dioxide in air was found to be  $62.6 \mu\text{g}/\text{mg Fe}_2\text{O}_3$ . The reaction rate constant for the heterogeneous reaction was estimated to be  $9.4 \times 10^{-3} \text{ ppm}^{-1}\text{-min}^{-1}$ . These parameters were not sensitive to either relative humidity or sulphur dioxide concentrations. When the capacity was depleted, the average surface coverage with sulphate ions was estimated to be 1.6 ions/ $100 \text{ \AA}^2$ . The quantity of sulphur dioxide physically absorbed at  $23^\circ\text{C}$  was  $<0.05 \mu\text{g}/\text{mg Fe}_2\text{O}_3$ . The iron dissolved in the acid formed on the particles ranged from 0 to  $1.4 \mu\text{g}/\text{mg Fe}_2\text{O}_3$ .

## Clean up for law courts

The Royal Courts of Justice are to be cleaned and restored back to their Victorian elegance for the first time in their 99 years' history by London Stone Cleaning & Restoration Limited, a Pritchard Services Group member.

Construction of the law courts was first started by the architect, G. E. Street in 1874. He died the year before construction was finished in 1882 and his son, A. E. Street, and Sir Arthur Blomfield completed the work.

The courts made a handsome neo-gothic impression in pale Portland stone and dominated the top of Fleet Street. Unfortunately, nearly one hundred years of soot—especially before the Clean Air Act—and car fume pollution have now changed the almost white stonework to almost black. Some stonework is damaged and decayed.

Consequently, the large dirty building visually recedes from the eye.

The Property Services Agency of the Department of the Environment aims to change that. They have commissioned London Stone to clean the 700ft long Strand elevation. The work

is being carried out in two phases, each will take about three months to dry grit blast away layers of grime.

Mr K. J. Negus, managing director of London Stone, said: "The contract also requires some repointing and re-

painting window frames and down pipes."

Subsequent discussions with the law court's surveyors (Weatherall Green & Smith) and the DoE will decide on the extent of stone restoration required.



# SMOKE CONTROL AREAS

## Progress Report

Position at 30th June 1973

(Figures supplied by the Department of the Environment, The Welsh Office, The Northern Ireland Ministry of Development and the Scottish Development Department.

	England			Wales			*Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 31.3.73</b>	4,018	1,200,380	5,649,781	11	1,580	5,008	208	196,628	497,991	53	13,081	30,186
Acres .. .. .												
Premises .. .. .												
<b>Smoke Control Orders Confirmed (31.3.73-30.6.73)</b>	110	52,545	183,005	3	381	2,094	6	2,876	11,201	2	906	2,770
Acres .. .. .												
Premises .. .. .												
<b>Totals .. .. .</b>	<b>4,128</b>	<b>1,252,925</b>	<b>5,832,786</b>	<b>14</b>	<b>1,961</b>	<b>7,102</b>	<b>214</b>	<b>199,504</b>	<b>509,192</b>	<b>55</b>	<b>13,987</b>	<b>32,956</b>
<b>Smoke Control Orders Submitted (31.3.73-30.6.73)</b>	82	58,842	113,471	—	—	—	2	424	3,338	1	—	—
Acres .. .. .												
Premises .. .. .												
<b>Grand Totals .. .. .</b>	<b>4,210</b>	<b>1,311,767</b>	<b>5,946,257</b>	<b>14</b>	<b>1,961</b>	<b>7,102</b>	<b>216</b>	<b>199,928</b>	<b>512,530</b>	<b>56</b>	<b>13,987</b>	<b>32,956</b>
<b>Smokeless Zones (Local Acts) in operation.. ..</b>	44	3,400	41,060	—	—	—	—	—	—	—	—	—
Acres .. .. .												
Premises .. .. .												

\* These revised figures are provided by the Department

## SMOKE CONTROL POSITION IN REGIONS OF ENGLAND

at 30th June 1973

(Figures supplied by the Department of the Environment)

(1) Region	(2) No. of black area acres covered by smoke control and smokeless zones orders confirmed or awaiting decision	(3) Percentage* of total black area acreage in region covered	(4) No. of black area premises covered by smoke control and smokeless zones orders confirmed or awaiting decision	(5) Percentage* of total black area premises in the region
Northern .. .. .	62,587	49.9	260,836	47.2
Yorks & Humberside .. .. .	260,506	69.2	823,538	70.5
East Midlands .. .. .	86,514	32.2	261,315	51.1
Greater London .. .. .	294,651	90.1	2,441,879	92.5
North West .. .. .	241,102	60.1	1,019,032	59.8
West Midlands .. .. .	106,598	42.8	484,561	46.1
South West .. .. .	11,231	42.6	41,278	27.7
Total (black areas) .. .. .	1,063,189	59.9	5,332,439	68.6
Outside black areas .. .. .	189,736		500,347	
<b>Grand Totals .. .. .</b>	<b>1,252,925</b>		<b>5,832,786</b>	

\* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (eg: there may be some areas of open country).

# New Smoke Control Orders

*The lists below are supplementary to the information in the last issue of Clean Air (Summer 1973) which gave the position up to 31 March 1973. They now show changes and additions up to 30 June 1973.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.*

## ENGLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

#### Northern

Teesside (No. 9A), Teesside C.B. "D".

#### Yorkshire and Humberside

Brighouse B.C. (No. 19), Leeds C.B. (No. 96) (No. 97).

#### North West

Irlan U.D. (No. 5), Tyldesley U.D. (No. 4).

#### Greater London

Merton L.B. (No. 21).

#### Outside the Black Areas

Chesterfield R.D. (No. 13), Scunthorpe B.C. (No. 9), Stanley U.D. (No. 3) (Durham).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

#### Northern

Blaydon U.D. (No. 5), Newburn U.D. (Nos. 16, 17, 18 and 19), Teesside C.B. (Nos. 14 and 15), Tyne-mouth C.B. (Nos. 15, 16 and 17), Whickham U.D. (Nos. 12 and 13).

#### North West

Accrington B.C. (No. 13), Altrincham B.C. (No. 12), Birkenhead C.B. (Nos. 9 and 11), Blackburn C.B. (No. 14), Brierfield U.D. (No. 7), Farnworth B.C. (Nos. 7 and 8), Heywood B.C. (No. 11A), Kearsley U.D. (No. 6), Leicester C.B. (Nos. 31, 32 and 33), Litherland U.D. (No. 3), Manchester C.B. (Crumpsall), Middleton B.C. (No. 20), Swinton & Pendlebury B.C. (Nos. 8 and 9), Tyldesley U.D. (No. 5), Wigan C.B. (No. 11).

#### Yorkshire and Humberside

Batley B.C. (No. 8), Darton U.D. (Nos. 24, 25 and 26), Horsforth U.D. (No. 33), Hoyland Nether U.D. (No. 3), Leeds C.B. (Nos. 111 and 112), Mirfield U.D. (No. 13), Rawmarsh U.D. (No. 1 Monkwood), Rotherham C.B. (Wellgate), Royston (No. 2), Wakefield C.B. (Denby Dale Road No. 1), Wakefield C.B. (Lupset No. 1), Wakefield C.B. (Thornes Lane No. 2).

#### East Midlands

Arnold U.D. (Nos. 5A and 12A), Chesterfield B.C. (No. 7), Derby C.B. (Nos. 25, 26, 27 and 28), Dronfield U.D. (No. 8), Kirkby-in-Ashfield U.D. (Nos. 7 and 8), Nottingham C.B. (No. 6), Sutton-in-Ashfield U.D. (No. 1), West Bridgford U.D. (No. 2).

#### West Midlands

Bedworth U.D. (No. 5), Birmingham C.B. (No. 161), Nuneaton B.C. (No. 7), Stoke-on-Trent C.B. (No. 27), Sutton Coldfield B.C. (No. 27), Walsall C.B. (No. 16).

#### Greater London

Barking L.B. (No. 12), Bexley L.B. (No. 13), Brent L.B. (Nos. 8 and 10), Croydon L.B. (No. 15), Enfield L.B. (No. 19), Hillingdon L.B. (Nos. 21 and 22), Lambeth L.B. (No. 29), Merton L.B. (No. 26), Sutton L.B. (Nos. 26 and 28), Waltham Forest L.B. (No. 18).

#### Outside the Black Areas

Aylesbury B.C. (No. 3), Belper R.D. (No. 4), Bentley-with-Arksey U.D. (Nos. 4 and 5), Blaby R.D. (No. 8), Blackburn R.D. (No. 3), Cambridge B.C. (No. 3), Colne Valley U.D. (No. 2), Hazel Grove & Bramhall U.D. (Nos. 8 and 9), Royal Leamington Spa B.C. (No. 14), Lichfield C.B. (Nos. 1 and 2), Marple U.D. (No. 6), Northampton C.B. (Nos. 9 and 10), Portsmouth C.B. (No. 1), Potters Bar U.D. (No. 5), Preston R.D. (Penwortham No. 1), Reading C.B. (No. 19), Runcorn R.D. (No. 7), Saddleworth U.D. (No. 2), Skipton R.D. (Sutton No. 2), Skipton U.D. (No. 9), Slough B.C. (No. 15), Southport C.B. (Nos. 2 and 3), Stanley U.D. (Burnopfield No. 1 and Lintz No. 2), Workington B.C. (No. 2), Wortley R.D. (Grenoside).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

#### Northern

Gosforth U.D. (No. 5), Hebburn U.D. (No. 15), Jarrow B.C. (Nos. 11

and 12), Newburn U.D. (No. 20), Newcastle upon Tyne C.B. (Nos. 16, 17 and 18), Sunderland C.B. (No. 12), Teesside C.B. (Nos. 11, "H" and 16), Whickham U.D. (Nos. 14 and 15).

#### Yorkshire and Humberside

Barnsley C.B. (Nos. 15 and 18), Conisbrough U.D. (Nos. 2, 3 and 4), Darton U.D. (Nos. 27 and 28), Dewsbury C.B. (North Eastern), Halifax C.B. (No. 19), Heckmondwike U.D. (No. 10), Huddersfield C.B. (Fartown-Brackenhall), Keighley B.C. (No. 9), Leeds C.B. (Nos. 113, 114 and 115), Mexborough U.D. (No. 3), Rawmarsh U.D. (No. 2), Swinton U.D. (No. 15), Wakefield C.B. (Park No. 1), Worsbrough U.D. (No. 1).

#### North West

Ashton-in-Makerfield U.D. (No. 1), Ashton-under-Lyne B.C. (No. 16), Barrowford U.D. (No. 6), Birkenhead C.B. (Nos. 15, 18 and 27), Bolton C.B. (Astley Bridge, Holliwell, and West Wards), Bootle C.B. (No. 13), Darwen B.C. (No. 13), Great Harwood U.D. (No. 5), Huyton-with-Roby U.D. (No. 9), Leigh B.C. (Nos. 14 and 15), Oldham C.B. (No. 20), Oswaldtwistle U.D. (No. 5), Prestwich B.C. (No. 12), Rochdale C.B. (Townhead & Whitworth Road), Worsley U.D. (No. 13).

#### East Midlands

Alfreton U.D. (No. 7).

#### West Midlands

Aldridge Brownhills U.D. (No. 36), Sutton Coldfield B.C. (Nos. 24 and 28), Walsall C.B. (No. 17), Wolverhampton C.B. (No. 18).

#### South West

Bristol C.B. (No. 11).

#### Greater London

Bromley L.B. (Nos. 19, 20 and 21), Southwark L.B. (Nos. 29 and 30).

#### Outside the Black Areas

Burnley R.D. (No. 2), Guildford B.C. (No. 1), Hale U.D. (No. 5), Harrogate B.C. (No. 3), Hazel Grove & Bramhall U.D. (No. 10), Hemsworth R.D. (South Kirkby No. 1), Lancaster C.B. (No. 7), New Windsor R.B. (No. 3), Rawtenstall B.C. (No. 7), Saltburn & Marske-by-the-Sea U.D. (No. 4), Seisdon R.D. (No. 3), Scunthorpe B.C. (No. 10), Shrewsbury B.C. (No. 2), Southwell R.D. (No. 3), Thurrock U.D. (No. 10), Waltham Holy Cross U.D. (No. 7), Warrington R.D. (No. 10), Whiston R.D. (Halewood No. 2).

**WALES**

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET IN  
OPERATION**

Menhost C.B. (No. 1), Wrexham  
B.C. (Nos. 8 and 9).

**NORTHERN IRELAND**

**NEW SMOKE CONTROL ORDERS  
IN OPERATION**

Hillsborough R.D.C. (No. 3).

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET IN  
OPERATION**

Craigavon D.C. (No. 1), Belfast  
C.B.C. (No. 11).

**NEW SMOKE CONTROL ORDERS  
SUBMITTED BUT NOT YET  
CONFIRMED**

Belfast C.B.C. (No. 8).

**SCOTLAND**

**NEW SMOKE CONTROL ORDERS  
IN OPERATION**

Airdrie (No. 1), Ayr County  
(Pennyburn), Barrhead (No. 4  
Ferenze), Bearsden (No. 4), Edin-  
burgh (Craigmillar No. 1 (Pt. 1)),  
Paisley (Westend, Dykebar No. 11,  
Candren No. 12 and Barshaw No. 13).

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET IN  
OPERATION**

Airdrie (No. 2 Thrashbush), Dun-  
barton Burgh (No. 11), Dundee  
(Broughty West), Fife County (Glen-  
rothes No. 4), Milnegavie (No. 3),  
Stirling County (Laurieston).

**NEW SMOKE CONTROL ORDERS  
SUBMITTED BUT NOT YET  
CONFIRMED**

Ayr County (Dundonald, Cross-  
house and Bishopbriggs), Grange-  
mouth, Rutherglen (Gallowflat No. 1),  
Clackmannan (Menstrie and Cambus).

---

# **HAVE YOU REGISTERED?**

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# TORQUAY



On the 1st April, 1968, the three closely linked neighbouring towns of Torquay, Paignton and Brixham merged to become the County Borough of Torbay.

Torquay, like Rome of old, is built on seven hills and arrests the eye of the visitor immediately he arrives. From the shores of the lovely bay rise wooded hills dotted with white residences, and on a sunny day these often look down on a sea of Mediterranean blue, gay with yachts, speedboats and other craft and oft-times sprinkled with "ships of the fleet". Torbay is a famous yachting centre and in 1948 accommodated the Olympic Yachting events. The Summer regattas are very popular.

The beautiful Torre Abbey, with monastic ruins of great interest and lawns running right down to the sea is one of Torquay's very special features. In the monastic barn of the Abbey were imprisoned the captured crew of one of the ships of the Spanish Armada so that the barn, now restored to its former beauty, is known as the "Spanish Barn".

Alongside the Pavilion lies the Inner Harbour which introduces a quaint old-world touch amidst modern shops and busy thoroughfares.

Beyond the Inner and Outer Harbours the coastline stretches on to Babbacombe and St. Marychurch, a

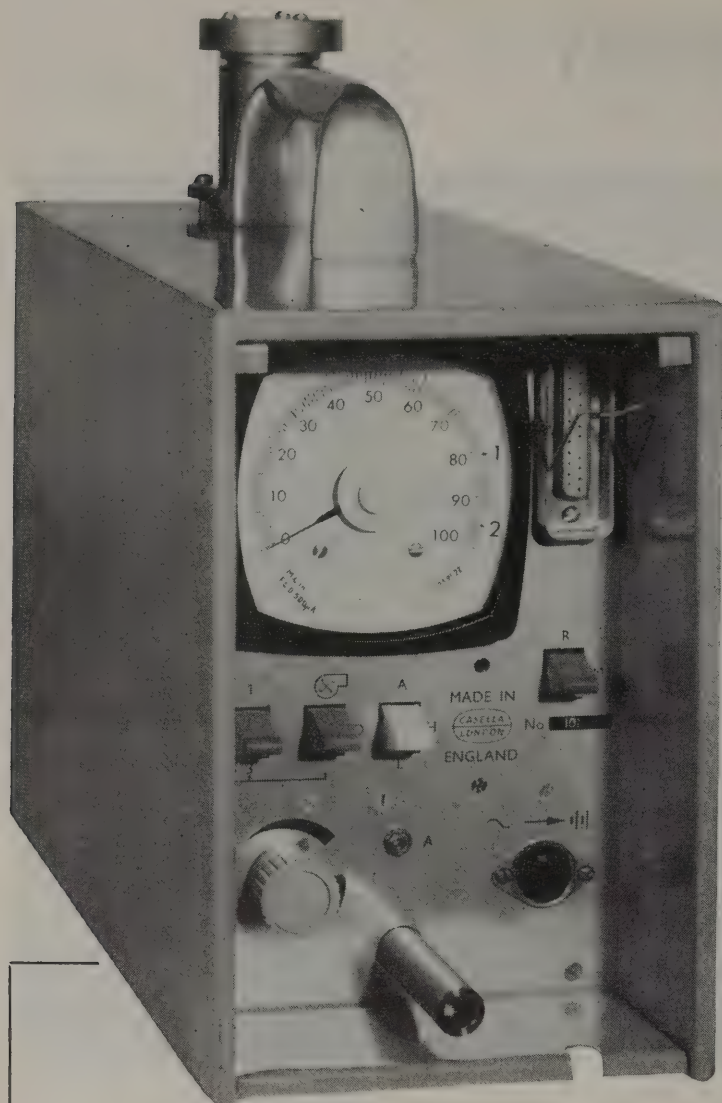
beautiful suburb more popularly known as "The resort within a resort". Babbacombe has its own hotels, shopping centre and entertainments and from the Downs there is a breathtaking vista of coastline as far as Portland Bill. Two beaches nestle below the red cliffs and can be reached by a cliff railway which descends 300 ft of wooded cliff, and by road or footpath.

Linking the centre of Torquay with Babbacombe is the superb Marine Drive, winding along the cliff top after the ascent from Meadfoot Beach and dipping down eventually to join the Sylvan Road past Anstey's Cove, once the haunt of smugglers, and Redgate Beach. Nearby is Kents Cavern, world-famous caves from whose depths have been unearthed tools and animal remains of the Great Ice Age.

In Paignton there is the Festival Hall and this new amenity together with Torquay's relatively new Princess Theatre, the Pavilion Theatre and Babbacombe Theatre provide a varied entertainment programme.

Near Torquay is Cockington, the old-world thatched village to which reference is made in the Domesday Book. This charming village traces its history to the 11th century and the 14th century blacksmith's forge is of special interest. There is a delightful church and the lovely lakes, gardens and grounds will reward exploration.

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with an effective scale length of 4½ inches. The range of concentrations is achieved by a dual electrode system having a sensitivity difference of about ten times. Two interchangeable bubblers further extend the range by ten times. A few minutes sampling gives a significant change in the meter reading so that a series of readings may be obtained on a single solution within the range of 1–500ppm. The larger bubbler gives readings from 0.005 to 0.5 ppm for up to 24 hours.



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# BOOK REVIEWS

## **The Law and Administration Relating to Protection of the Environment**

*D. A. Bigham. Oyez Publications. 360 pages. Price £3.00.*

Although this might be described as a legal text book Mr. Bigham's work does not follow the orthodox pattern of such a book and relate the law to the subject. He relates the subject, protection of the environment, to the law. As Professor D. R. Denman says in the foreword, Mr. Bigham "takes our hand and guides us: first to the administrative structure and the springs of policy making; then to show how the environment is affected by industry and agriculture; thirdly, to man's activities, manifest in transport, pollution and the built environment; and finally to problems of nature and her conquest by man".

This book starts with a table of cases, a table of statutes and a table of rules and orders and is well supported by an adequate index. Mr. Bigham considers the general control of the environment vis a vis the systems of Government that we employ in this country and discusses the broad fields of environmental policy covered by the law. Industry and the countryside, pollution of the air, pollution of the land and pollution of water are discussed in turn together with the laws which affect them. Generally the legal position and the various statutes controlling pollution are well set out and are easy to follow, but it is unfortunate in the section on air pollution that in a book published in June 1973 no mention is made of the latest legislation regarding emissions from petrol-engined motor vehicles.

This is a useful book of reference. In his preface Mr. Bigham Says: "In the sometimes well nigh impenetrable jungle of environmental administration this may serve to reduce the difficulty of 'seeing the wood for the trees'—whereby painful collisions may, perhaps, be avoided." This book undoubtedly does provide a guide through this jungle and it merits a place on the shelves of anyone concerned with conservation of the environment.

Reader Enquiry Service No. 7369

## **Air Pollution and Lichens**

*Edited by B. W. Ferry, M. S. Braddeley and D. L. Hawksworth. The Athlone Press of the University of London. £6.25 net.*

A great many books on ecology and pollution have been flooded on to the market in recent years, mostly of a general nature, dealing with pollution control, resources, management etc., with only a small section reserved for air pollution. At last a volume on air pollution has appeared mainly as a result of the symposium on Air Pollution and Lichens which was part of the First International Mycological Congress held at Exeter, England, in 1971.

At this Symposium it was realised that there was a wealth of information on the subject, but that it was

somewhat dispersed. Recommendations were made, and this book, the first of this kind, attempting to bring as much relevant data together as possible. The editors have tackled this problem by using the writings of 19 contributors, mainly in the form of review papers, but there is a smaller contribution of original research and previously unpublished data.

A broad coverage is presented, pertinent reviews on the introduction and behaviour of sulphur dioxide in the air (Ch. 2) and the distribution of lichens and lichen maps (Ch. 3, 4, 5), are included. Most of the work on lichens has involved their reaction to sulphur dioxide, and air pollution in terms of lichen behaviour and has almost become synonymous with SO<sub>2</sub> pollution, but care is taken by Braddeley and Ferry in the summary to emphasize the danger of equating these two. Attention is drawn to the chapter on other air pollutants (Ch. 8 and 9) and to the need for further work on the problems of heavy metals in the atmosphere.

Recent work has shown correlations between sulphur dioxide levels and lichen flora. The concept of zone maps is well documented by Hawksworth (Ch. 3) and their value as biological indicators is obviously apparent.

There is also included an extremely useful chapter by Nash on the effect of air pollution on vascular plants. The effects of nitrous oxides, PAN, ozone, and particulates are discussed as well as the effect of SO<sub>2</sub>.

Most of the work on lichens has been made in the field, and although there is a section on lichen physiology and metabolism in this book it is evident that there is a need for further laboratory work to be correlated with field results.

In conclusion, this book will provide the specialist and also those working in broader fields with a comprehensive view of the existing literature on lichens and air pollution, and will provide a long list of references for further reading. It is inevitable that it will also become a standard text in the botanical and environmental courses in most colleges and should be present in all natural science libraries.

*Dr G. D. R. Parry*

Reader Enquiry Service No. 7370

## **Biological Indicators of Environmental Quality. A Bibliography of Abstracts.**

*William A. Thomas, Gerald Goldstein and William H. Wilcox. Ann Arbor Science Publishers Inc. Price £8.25.*

This is a source book on biological indicators. The concept is that living organisms provide the most accurate assessment of environmental quality because they are subjected to the combined effects of all stresses (opposed to mechanical devices which measure only the levels of single pollutants). This worldwide system of readily available monitors is being recognized increasingly by scientists and others. This compilation of abstracts is designed to promote the use of these monitors.

Selected abstracts emphasize the practical aspects of interpreting the biological manifestations of deteriorated environmental conditions and are organised so that users can focus their attention at any level of biological organisation from the molecule to the community.  
Reader Enquiry Service No. 7371

#### **Plastics and the Environment**

*Issued by The British Plastics Federation. Published by Hutchinson Benham Ltd.*

**The disposal of solid wastes.** F. L. D. Flintoff  
**Recycling, re-use and recovery of plastics.** F. L. D. Flintoff

**The storage and collection of refuse.** A. E. Higginson  
**Plastics, their contribution to society and considerations of their disposal.** Dr. W. C. Fergusson

**Degradability of plastics.** Prof. E. M. Evans

Plastics are a family of man-made materials which, in a short space of time, have come to fill a major role in our everyday world.

The environmental benefits of plastics in today's society are greater than is recognised. Being materials of recent origin, knowledge of their utilisation and disposal is limited. Because misconceptions have thereby arisen, the British Plastics Federation has commissioned a series of publications dealing with plastics in the environment. Each of the authors is an acknowledged authority on his subject.

The aim of the series is to provide factual data helpful to a better understanding by all sectors of the community. It will be seen that as a result of close collaboration between the plastics industry and Public Health authorities, it is possible to resolve problems of the disposal, by socially acceptable methods, of increasing quantities of used plastics.

Reader Enquiry Service No. 7372

#### **Air Pollution Aspects of Emission Sources: Pulp and Paper Industry. A Bibliography with Abstracts** *U.S. Environmental Protection Agency.*

The Air Pollution Technical Information Centre (APTIC) of the Office of Air Quality Planning and Standards prepared, selected and compiled the abstracts on the pulp and paper industry in this bibliography. Approximately 700 categorised abstracts refer to emission sources, measurement methods, atmospheric interaction, effects (Human, Agriculture, Materials, Economy), legal and administrative and social aspects. The abstracted documents are thought to be representative of the available literature; however, no claim is made to all inclusiveness. The author index lists all authors individually.

Reader Enquiry Service No. 7373

#### **Air Pollution Translations. A Bibliography with Abstracts. Volume 3 and 4.** *U.S. Environmental Protection Agency.*

These volumes of Air Pollution Translations are the third and fourth in a continuing series representing abstracts and indexes of translations of technical air pollution literature. The entries are grouped into subject categories and arranged in numerical order using the 'APTIC' accession number. Included in this bibliography is a listing of monograph and journal translations prepared for the Environmental Protection Agency.

Reader Enquiry Service No. 7374

#### **Education for Our Future**

*Published by the Conservation Society. 20 pages. Price 20p.*

In this booklet the Conservation Society urge major changes in school syllabi to take account of what they describe as an environmental crisis.

Future educational policy in Britain should, they say:

Make sure that people, especially the young, appreciate man's place in time . . . and the critical nature of his present phase.

Promote the study of ecology as a help in understanding the nature of mankind's present predicament.

Give all people, again especially the young, information on the three interrelated areas of population, resources and environment.

Maintain a debate on the social conditions required to make a smooth transition to a "sustainable society".

Encourage schools, colleges and universities to become closely involved with the life of the communities they serve.

The booklet states that special courses should be mounted at once for pupils and students in their final year. More important, however, it considers that teachers, senior representatives of the professions, of industry, commerce, local government and the trade unions should be helped to act on its recommendations; for, they say, until the generation of forty and fifty year olds have been made aware that an environmental crisis exists, no progress can be made.

While we are not convinced that what the Conservation Society describes as an environmental crisis does exist, we would agree with the view that no important political or economic decision should be taken without considering the ecological consequences. Although we cannot agree by any means with all that it says, the booklet does fulfil a useful purpose and provides much food for thought.  
Reader Enquiry Service No. 7375

#### **Electrical Association for Women**

*48th Annual Report 1972, and report of the Caroline Haslett Memorial Trust.*

1972 was a notable year for the EAW bringing more demands for courses at educational establishments. The aim of the EAW is to teach people the most efficient and safe use of electricity, the expression of a woman's point of view in the design and performance of electrical equipment, and to create an informed public opinion on the contribution to home making and welfare of the community.

The Caroline Haslett Memorial Trust is one of the few educational charities operating in scientific and technical areas whose awards are reserved for women.

During the year, the public image of the EAW was portrayed in a number of exhibitions, and the Association featured in many broadcasts and publications.  
Reader Enquiry Service No. 7376

#### **Recommended Code of Practice for the Handling and Disposal of Asbestos Waste Materials** *The Asbestosis Research Council.*

The Asbestosis Research Council has issued a revision of its recommended Code of Practice, 'For the Handling and Disposal of Asbestos Waste Materials'. Since the Code was originally issued, new regulations, 'The De-

posit of Poisonous Waste Act 1972' have come into force. While this does not call for any change in the methods of collection and disposal of asbestos waste recommended in the ARC Code, there is a requirement under section 3 of the Act for notification to responsible authorities before removing or depositing waste which is liable to give rise to an environmental hazard.

This statutory duty supersedes advice previously given in the ARC's Code and an appendix has been added to the Code which gives guidance concerning these statutory duties and includes a form of notification for use in compliance with this part of the Act.  
Reader Enquiry Service No. 7377

#### **Solid Smokeless Fuels Federation Annual Report 1972-1973**

As expected 1972/73 proved to be an important year for the Federation and the Solid Fuel Industry as a whole. It saw the completion of the current plans of the producer members of the Federation to build new plant to make the quality solid smokeless fuels required to meet the anticipated demand on the domestic and semi-industrial markets in the foreseeable future. During the last few years the plant production capacity has been increased by some three million tons per annum.

Stands were taken at an increased number of Ideal Homes Exhibitions, Home Improvement Exhibitions and Home Heating Exhibitions to demonstrate to the public the new range of solid fuel burning appliances. The retention rate for solid fuel in many new smoke control areas increased during the year; this is another welcome sign that the interest in solid fuel heating is continuing to grow.  
Reader Enquiry Service No. 7378

#### **New additions to the National Society of Clean Air Library, available on Loan**

**Ferry, B. W., Baddeley, M. S., and Hawkesworth, D. L., Editors.** Air Pollution and Lichens. The Athlone Press of the University of London.

**U.S. Environmental Protection Agency.** Research Study to Determine the Range of Carboxyhemoglobin in Various Segments of the American Population.

**Huntley, R. James.** Man's Environment and the Atlantic Alliance, Nato Information Service, 2nd Edition.

**British Gas Marketing Division.** A Guide to the Gas Safety Regulations.

**Williamson, Peter.** The Environment of Nuclear Stations in England and Wales, Central Electricity Generating Board.

**Warren Spring Laboratory.** National Survey of Air Pollution 61-71, East Anglia, East Midlands, West Midlands.

**Semrau, Konrad T.** Air Pollution in Western Europe, a working draft.

**Electrical Association for Women,** 48th Annual Report.

**Matthew, A. E. T., Covell Matthews & Partners.** Underways to London's Traffic Transport Problem 1972.

**Swedish Environment Protection Board.** Environment Protection in Sweden.

**Swedish Ministry of Agriculture and the National Environment Protection Board.** Environment Protection.

**Environment Agency.** Air Pollution Control in Japan.

**The Conservation Trust.** Education for our Future.

**CoEnCo.** Some Effects of Supersonic Flight.

**Solid Smokeless Fuel Federation.** Annual Report, 1972-1973.

**Thomas, William A., Goldstein, Gerald, Wilcox, William H.** Biological Indicators of Environmental Quality, A Bibliography of Abstracts; Ann Arbor Science Pub.

**The Asbestosis Research Council.** Recommended Code of Practice for the Handling and Disposal of Asbestos Waste Materials, revised March 1973.

**Bigham, D. A.** The Law and Administration Relating to Protection of the Environment. Oyez Publications.

**U.S. Environmental Protection Agency.** Air Pollution Aspects of Emission Sources: Pulp and Paper Industry, a Bibliography with Abstracts.

**U.S. Environmental Protection Agency.** Air Pollution Translations, a Bibliography with Abstracts.

**U.S. Environmental Protection Agency.** Control Techniques for Mercury Emissions from Extraction and Chlor-Alkali Plants.

**U.S. Environmental Protection Agency.** Control Techniques for Beryllium Air Pollutants.

**U.S. Environmental Protection Agency.** Control Techniques for Asbestos Air Pollutants.

## **Environment talks free for 30 students**

Industry is to sponsor 30 free places for students at the conference on fuel and the environment to be held at Eastbourne next November.

"We want to ensure that young people have a chance to contribute their views on the subject," states the Institute of Fuel, organisers of the three-day event (27th-29th November).

The money is being put up by the nationalised fuel industries, oil companies and chemical interests. Conference fee is £42, including attendance at all sessions and copy of the proceedings.

To qualify, students must show that their studies embrace some aspect of the conference discussions. They will be chosen by the Institute of Fuel's education committee.

The event has three main objectives: consider the impact on the environment of the fuel industries; discuss with all interests how far those effects can be reduced, and make practical suggestions. The Duke of Edinburgh is chairman of the organising committee.

Enquiries to the Conference Secretary, Institute of Fuel, 18 Devonshire Street, London W1N 2AU.

# National Society for Clean Air

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### **NORTH-WEST**

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### **NORTH-EAST**

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### **EAST-MIDLANDS**

E. F. Raven, Divisional Inspector, Smoke Control, Public Health Dept., County Borough of Derby, Castlefields House, Main Centre, Derby DE1 2FL (Derby 31111)

### **WEST-MIDLANDS**

F. Reynolds, C. Eng., F.R.S.H., MAP.H.I., M.Inst.F., Public Health Dept., Trafalgar House, Paradise Street, Birmingham B1 2BQ (021-235-3759)

### **SOUTH-EAST**

R. F. Shapter, F.A.P.H.I., Public Health Dept., 8 Easton Street, High Wycombe (High Wycombe 26100)

### **SOUTH-WEST**

D. J. Barnett, Chief Public Health Inspectors' Office, Union House, Union Street, Bristol BS1 (0272 26241).

### **SOUTH WALES and MONMOUTHSHIRE**

L. Morgan, 9 Lodge Drive, Baglan, Port Talbot (5231)

The parent of the Society was the Coal Smoke Abatement Society, established in London in 1899. It did valuable pioneering work and accomplished the first necessary stage of making it understood that clean air was not the pet notion of a few cranks. It co-operated with a provincial association that had been formed in 1909—the Smoke Abatement League of Great Britain. These two bodies amalgamated in 1929 to form the National Smoke Abatement Society. This name was retained until 1958, when it was changed to the present one.

From a handful of individuals the Society's membership has grown to include not only considerable private membership both at home and abroad, but membership of local authorities, corporate bodies, (representing the Learned Societies and Institutions),

the fuel industries and those industries concerned with the production of appliances and equipment connected with clean air.

The Society is a voluntary body and receives no official grant, and therefore essentially subsists on the subscriptions of its members. The general policy of the Society is Directed by the Executive Council and its Committees. There are twelve Divisional Councils of members, with their own committees and honorary officers.

The Society's objects are, in brief, to promote and create by publicity and education an informed public opinion on the value and importance of clean air and to initiate, promote and encourage the investigation and research into all forms of atmospheric pollution in order to achieve its reduction or prevention.

## Membership of the Society and Subscriptions

Membership of the Society is open to any individual, corporate body or local authority. Subscription rates are given below.

### **Individual Members**

Not less than £3. Subscriptions can be paid by Covenant, minimum of seven years at £1.83, the balance being recoverable from the Inland Revenue by the Society. Those Members wishing to pay their subscription by Bankers order or wish to Covenant with the Society are requested to apply for the necessary forms for completion.

### **Local Authority Members**

Population	£	
Less than 25 000	10	appointing 2 representatives
25 001 to 50 000	13	appointing 2 representatives
50 001 to 75 000	17	appointing 2 representatives
75 001 to 100 000	23	appointing 3 representatives
100 001 to 175 000	35	appointing 3 representatives

175 001 to 250 000	40	appointing 4 representatives
250 001 to 375 000	45	appointing 4 representatives
375 001 to 500 000	50	appointing 5 representatives
Over 500 000, £15 and 1 additional representative for each additional 1 000 000 of population or part thereof.		

### **Corporate Members**

Not less than £40 (appointing 4 representatives and 2 delegates in each appropriate division) or not less than £23 (appointing 2 representatives and 1 delegate in each appropriate division)

### **Associate Members**

Not less than £3

*Note:* The Society's subscription year commences 1st April.

National Society For Clean Air

# NEWS FROM THE DIVISIONS

## EAST MIDLANDS

The Annual General Meeting of the East Midlands Division was held at the National Coal Board Training Centre, Grassmoor, Nr. Chesterfield, on 5th July. The Chairman, Mr. H. B. Dunstan, in opening the meeting welcomed all those attending and said that he was especially pleased to welcome Mr. Stanley Cayton, the Chairman of Council of the Society, Mr. A. Bloomfield, Regional Marketing Manager, Coke Products Limited, and Mr. H. Giblin, General Manager of the Solid Smokeless Fuels Federation.

After the business of the meeting Mr. Cayton gave his address. Mr. Cayton felt that the thing in which people were most interested at present was the proposed reorganisation of the Society. An Extraordinary General Meeting would be needed to confirm the changes, and it had been necessary to discuss the proposals with the Department of Trade and Industry.

The Executive Council would be able to co-opt people from the learned organisation. The Chairmanship progression would be in yearly instead of two yearly changes. The Executive Council would be elected by the Divisions themselves. Mr. Cayton then reviewed the changes proposed in the Divisions and said that the Society was grow-



Left to right: Mr. S. Woods, Manager, Avenue Coking Plant; Mr. H. B. Dunstan, Head of Domestic Sales Branch, National Coal Board, Midland Region, Immediate Past Chairman; Mr. E. F. Raven, Honorary Secretary, East Midlands Division; Dr. R. V. Riley, British Steel Corporation, Deputy Chairman; Mr. A. Bloomfield, Marketing Manager, Coke Products Midlands

ing up. The formal business of the Executive Council could be completed in 90 minutes and thought was accordingly being given to dealing with the formal business before lunch and having a paper presented, with the Press in attendance, in the afternoon.

Mr Cayton thanked the Division for the opportunity to attend and said that the East Midlands had caused a little joke at Headquarters where it was said there was one Secretary for the Society and one for Mr. T. Henry Turner.

An introduction to Coking Ovens and By-Products was given by Mr A. Bloomfield, Marketing Manager, Coke Products Midlands, who said there was a close relationship in the aims of the Society and Coke Products in promoting clean air and they had common ground in desiring the use of smokeless fuels. The coming into force of the Coal Industrial Bill had required changes in non-mining activities and this had led to the setting up of NCB Coal Products Limited which had also taken the Coal Board's associated Chemical Interests. The industry had a wide variety of interests including the search for oil and gas.

Mr. Bloomfield gave further details of the undertaking and said that it was a matter of concern that world energy demands had doubled in the past 12 years and could double again in the next 12 years. Demand in the U.S.A. was equivalent to the entire current disposals of the Middle East.

The coal products industry was under pressure and the National Coal Board generally was likely to experience a high demand for coking and power station coals in the next five years. The industry at present carbonised 8 million tons of coal annually to produce 6 million tons of coke and briquettes.

Mr. Bloomfield said there was an intense challenge in the competition in the domestic market, but it was expected there would be a demand for 1½ million tons of Sunbrite for some years to come. Despite a mild winter there had been an increase in the sale of briquetted fuels and the demand for Phurnacite was always exceptional. Careful attention was given to the quality of the products and all fuels produced were authorised for use in approved appliances.

In a reference to sales of petra-cokes and smoky foreign briquettes Mr. Bloomfield said he applauded the action of Public Health Inspectors in refusing to allow the distribution of these fuels in smoke control areas.

Mr. Stanley Wood, Works Manager, Avenue Coking Plant, said the plant was conceived in 1950. With the advent of the Clean Air Act of 1956 there was a demand for smokeless fuels. The plant, on the site of an old colliery became operational in 1955. In addition to coke the plant produced 50,000 tons of tar per year and 32 million cubic feet of town gas per day. Of this 40 per cent was used in the works. The remainder was formerly

# the sweet smell of success

Waste disposal problems like tyres, waste oil, plastics, solid and liquid toxic materials and general industrial waste are real stinkers, an ecological problem in themselves.

Lees Hall have been getting rid of them successfully for years, without polluting the atmosphere.

Lees Hall ecoloburn range of incinerators have a comprehensive disposal capability which can solve your problem efficiently, economically and legally.

FOR YOUR  
SUCCESS STORY—  
WRITE OR PHONE.

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A member of the Sussex Metal Group

Reader Enquiry Service No. 7379

sold to the Gas Board but since the advent of natural gas this went to local industry. When production exceeded demand some had to be flared to waste. Mr. Wood gave further details of the products and touched on problems of pollution control.

Following the meeting members were entertained to an excellent buffet lunch when weather conditions were so good that some were moved to 'picnic' on the grass outside.

In the afternoon members were taken by coach to the Avenue Coking Plant and were taken round the plant in small parties by a number of guides who explained the working of the various parts of the undertaking and answered questions. There was an opportunity to see an oven being discharged. At the end of the tour refreshments were served.

The new Chairman, Alderman A. Lister Robinson, proposed a vote of thanks to Mr. Broomfield for providing the facilities for the Division to meet at Grassmoor and to visit the Coking Plant. The Secretary, Mr. E. F. Raven, expressed the thanks of the members for the excellent arrangements and thanked all those who had in any way been involved in making the meeting so successful.

*E. F. Raven*  
*Hon. Secretary*

## NORTH EAST

On the 27th April 1973 the North East Division held its Annual General Meeting at Coal House, Team Valley Trading Estate, Gateshead, as guests of the Solid Fuel Advisory Service. In the morning transport was provided by the Solid Fuel Advisory Services when coaches left the Central Station in Newcastle upon Tyne with some sixty delegates who visited Lambton Coke Works to inspect the coke blending plant. During the course of the tour of this plant much interesting information was obtained. It was pointed out that supplies of prime coking coals had for some time been diminishing both in quality and availability and that it had been found necessary to devise methods of producing artificially a high grade foundry coke from other types of coals of which in East Durham there were good reserves. Coals from local collieries were crushed and blended with small proportions of Welsh low volatile coal and finely crushed coke breeze which, after carbonisation, produced a high quality foundry coke at an economical cost. The various components for its production were stored in twenty 200 ton bunkers and blended from five small bunkers, the contents of each bunker and the flow of materials being governed electronically from a central control room.

Special reference was made during the tour to the continuous automatic sampling which ensured the maintenance of an optimum quality and a detailed account was given of the various tests to which the finished product was subjected.

This type of plant in operation at Lambton is one of the most modern of its type probably in the world and the delegates were greatly impressed by the care and thoroughness applied to each stage of the blending operations.

After embarkation on the coaches delegates were conveyed to the Annexe to Coal House, Team Valley Trading

Estate, Gateshead, where they enjoyed pre-lunch drinks, the lunch being kindly provided by the Solid Fuel Advisory Service. These excellent arrangements were under the general supervision of Mr. T. Whittock, Regional Manager of the Solid Fuel Advisory Service, who introduced Mr. W. Waite, Vice-Chairman of the Regional Joint Promotion Committee of the Solid Fuel Advisory Service. Mr White welcomed delegates and described the arrangements which had been made for the interest of members after the completion of the business meeting held later in the afternoon.

After lunch the Chairman, Alderman B. N. Young, O.B.E., rose to thank the Solid Fuel Advisory Service for the excellent facilities provided to enable the meeting to be held and for the generous hospitality which had been extended to all guests present. The Chairman referred to the extremely friendly and close relations which the North East Division had enjoyed with the National Coal Board and their associated services for so many years and in thanking the Solid Fuel Advisory Service he expressed the hope that this happy co-operation would continue for many years to come. These views were seconded by Mr. J. Wear, the Chief Public Health Inspector of Felling and the vote of thanks was carried with acclamation.

Lunch was followed immediately by the Annual General Meeting at which the Chairman in his address began by referring to the impending momentous changes in local government which he hoped would enable greater activity to take place in the field of smoke control and, in this way, make up for lost time in the region. He was, however, heartened with the evidence of renewed activity in the area during the last six months, largely due, he felt, to the activities of the Investigation Panel of the Clean Air Council, whose activities appear to have had quite a salutary effect in stimulating those authorities who hitherto might have been justifiably regarded as "smoke control laggards". He expressed the hope that reorganised local government in 1974 would enable an early completion to be made to all smoke control programmes.

After a brief reference to the proposals for the reconstruction of the Society and, in particular, the geographical boundaries of the new proposed Northern Division, he concluded by mentioning that he would be retiring from active public life in 1974. He had represented

Gateshead C.B.C. on the North East Division for 28 years, most of which period he had served on the Executive Council and he would find it a very considerable wrench to part company with all the many friends he had made during his association with clean air activities.

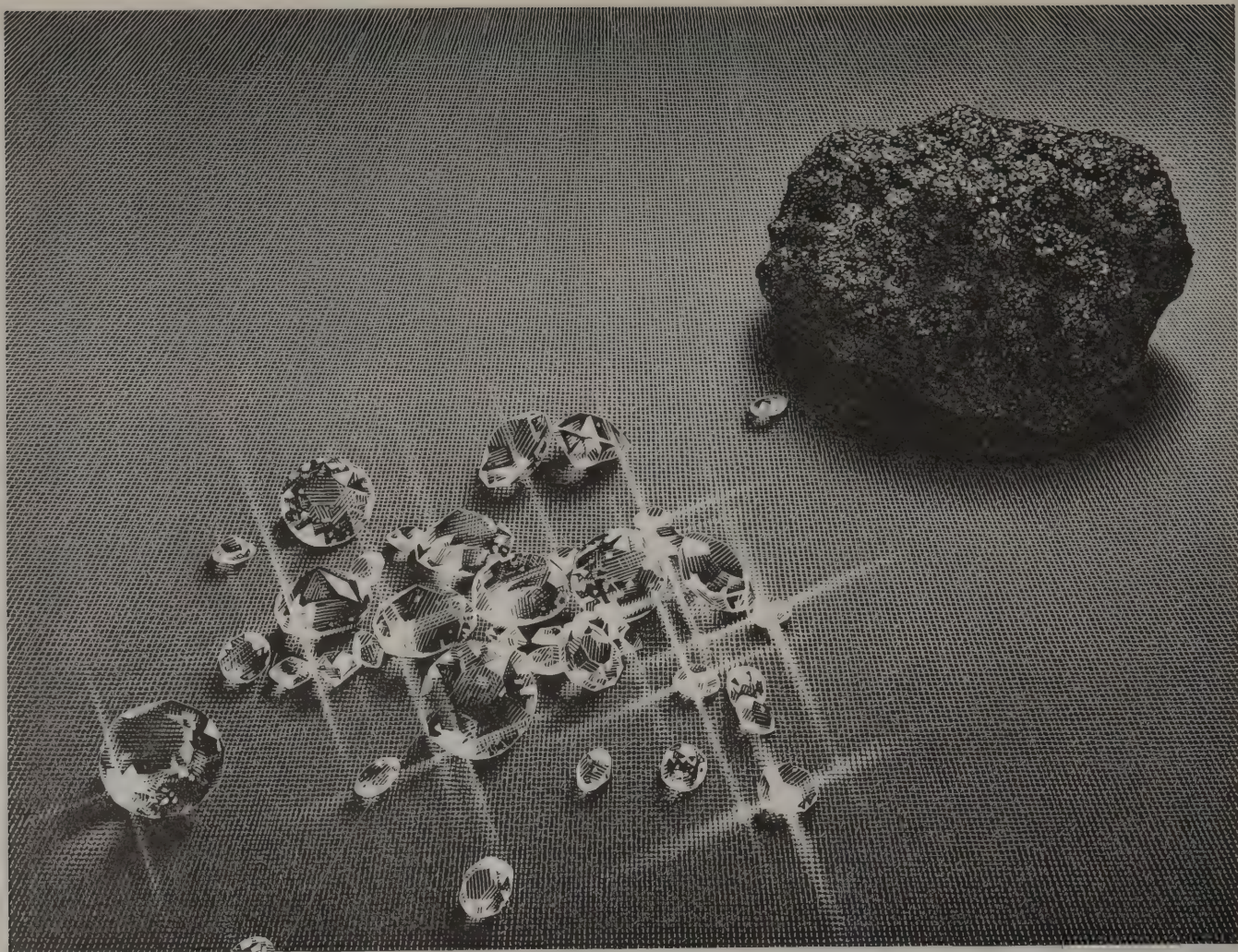
The Chairman's address was followed by the election of officers which resulted in Alderman B. N. Young, O.B.E., being re-elected as Chairman, Professor P. C. G. Isaac of the University of Newcastle upon Tyne and Councillor T. P. S. Prudham of Felling U.D.C. being re-elected as Vice-Chairmen, L. Mair being re-elected as Honorary Secretary and Treasurer and C. J. Davies being re-elected as Honorary Auditor.

The Honorary Secretary then submitted his report which dealt with the Arnold Marsh Clean Air Awards, enquiries which the Division had made on behalf of the Parliamentary and Local Government Committee in respect of clean air penalties and non-ferrous scrap, and investigations which had been made into the alleged nuisance arising from No Place Tip, Stanley. He spoke at length on the proposed reconstruction of the Society and its effect on the North East Division and the present constitution of the Divisional Council, which had previously been approved by the Executive Council, and concluded with a brief statement on the supply position of solid smokeless fuel circulated by the Director.

At the conclusion of the business meeting delegates were then transported to a Heat Centre which had been established at the premises of Messrs. Graham-Moat Ltd., in Rutherford Street, Newcastle upon Tyne, where they were welcomed most cordially by Mr. L. Penzer, Deputy Regional Marketing Director of the National Coal Board. At this centre, where an exhibition of a wide variety of solid fuel appliances of all types was being held, detailed explanations were given of the suitable applications of the appliances and their uses.

After being served with tea and refreshments members were then transported to the Central Station, Newcastle upon Tyne, where they dispersed after enjoying a most interesting, fruitful and informative day.

*L. Mair*  
*Hon. Secretary*



**Coalite, like diamonds, is a form of carbon.  
Coalite, like diamonds, is precious.**

Carbon is a pretty surprising element.  
It turns up in some wild guises. Like diamonds.  
Men have killed for them. Women have succumbed  
for them. Fortunes have been founded on them.

Diamonds are precious.

Another of carbon's guises is known  
commercially as Coalite. That, too, is precious.  
That, too, has had a spectacular effect on  
people's lives. Coalite has helped to make towns  
and cities nicer places in which to live.  
Cleaner places. Happier places.

Coalite is coal with the tar oil and  
smoke-producing agents extracted. When Coalite  
burns it gives off all the good things: warmth,  
welcome, and a wonderfully old-fashioned glow.  
It does not give off the bad things: smoke and  
soot and sparks.

When the Clean Air Act was introduced  
there was a great move to Coalite. And it wasn't  
long before you could see the effect. The air  
became cleaner and fresher. The sky bluer.

In fact, when you burn Coalite, you're  
making ours a better country in which to live.  
And yours a warmer home.

**Coalite**  
Fresh Air Fiends

"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## SWEDEN

The Swedish Environmental Protection Board have published a booklet on Environmental Protection in Sweden. Chapter 1 deals with Legislation divided into two sections (a) aimed directly at environment protection and (b) of importance to environmental protection. Administration is dealt with in Chapter 2 and Chapter 3 is devoted to Research. There is also a Chapter on Grants for environmental protection and plans of the Environmental Protection Board.

Also published by the Swedish Ministry of Agriculture and the National Environment Protection Board is a booklet on Environmental Protection—an expanding task for society. This has some very good colour photographs and illustrations. There are sections on "Our Natural Resources" and "Conservation of the Landscape". There is also a very interesting section on "Game Shooting and Game Management". The encroachment made by man on nature has also affected Sweden's animal life. Game shooting is necessary to keep animal life at a suitable level in cultivated and forest areas but it is permitted only during special seasons.

There are sections on Water and Air Protection, also on Noise Abatement as noise has become a problem both in work sites, residential areas and places far out in the country. These booklets are available on loan from the Society's Library.

## JAPAN

The Environment Agency of Japan have published a report entitled "Air Pollution Control in Japan". This is one of three special reports which the Government of Japan have presented as supplements to the National Report submitted in March 1971 to the United Nations Conference on the Human Environment. It is hoped that these reports will help member countries to obtain a better understanding of the human environment in Japan.

This report deals specifically with air pollution control in Japan and is intended to provide basic information on the subject. It outlines the general situation, as well as the various comprehensive measures taken by the central and local governments to prevent such pollution and to provide a better and more healthy environment. This publication is available on loan from the Society's Library.

## HUNGARY

The Aerosol Section of the Scientific Association for Power Economy are holding the Third Hungarian Conference on the Protection Against Air Pollution at Esztergom from the 4th to the 6th September, 1974. Further details may be obtained from: The Secretariat, The Scientific Association for Power Economy, P.O. Box 451, 1372 Budapest, Hungary.

## CANADA

Extract from "Daily Colonist", Victoria. "The key section of a Victoria, British Columbia, bylaw that went into effect last year states that outside burning must be confined to garden refuse from September to May and is not allowed at all through the three summer months.

The Victoria Fire Chief said the change was made by the city council because of provincial and other pollution laws. He declined comment when asked if any specific complaint had an effect. Like one story of two neighbours, one with an outside barbecue and the other with a smoky garden refuse fire, who wound up getting soaked in a battle of garden hoses.

Until August ends, garden refuse must be put in a compost heap. Or, in the case of a single-family dwelling, it can be disposed of via the garbage can. The laws do not apply to barbecues."

### World's Tallest Chimney Improves Environment

As part of its environmental control programme, The International Nickel Company of Canada Limited has built the tallest chimney in the world at its Copper Cliff, Ontario, operations in Canada.



Costing \$26 million, the 1,250-foot chimney, and its gas cleaning system, was commissioned in August, 1972. The new facility disperses the sulphur dioxide-bearing gas from the entire Copper Cliff smelter and has replaced two 500-foot stacks and another of 350 feet.

Since it came into operation, results from a continuing sulphur dioxide monitoring programme have been most encouraging. Ground level concentrations of sulphur dioxide have been consistently well within government standards.

Air pollution indices in the neighbourhood have been well below those of other industrial urban centres in Ontario and there have been no indications of increased concentrations in the more distant communities surrounding Copper Cliff.

The effective diffusion of waste gases depends on a combination of factors: stack height, nature and strength of the emission, its volume and temperature, and the speed at which it is emitted. The regional topography and prevailing weather conditions also have to be taken into account.

All these considerations were involved in the design of the new stack and, in fact, it was found that a 1,000-foot chimney would meet all environmental requirements, but a 25 per cent safety factor was added.

#### **First International Exhibition on Actual Means to Detect and Fight Pollution**

The Engineers' Association of Oporto are organising the first International Exhibition on Actual Means to

Detect and Fight Pollution which will be held in the Palacio de Cristal in Oporto in November 1973, and it will be called DECOPOL—73.

It is hoped that the following will be exhibited:

- (i) Instruments: Alarms, gas and water analysers, smoke and radioactivity detectors and control systems.
- (ii) Air Pollution Control Installations: Septic chambers, dust collectors, condensators, air-conditioners, chimneys, oxidation equipment, filters and ventilators.
- (iii) Water Pollution Control Equipment: Aerators, pumps, clarifiers, emulsifiers, diffusers, insufflators, compressors, biological and membrane systems.
- (iv) Various Installations: Sludge collectors, compactors, pulverisers, filters, garbage collection (transport, treatment and incineration thereof).
- (v) Products: Additives, emulsifiers, membrane filters, ozone generators.
- (vi) Private Entities: Under this heading they hope to attract firms of consulting engineers, laboratories, and firms already using pollution control equipment which may wish to exhibit for prestige reasons.

The Engineers' Association are also organising a Congress on Pollution which will take place during the Exhibition. The main themes will be polluters, activities which modify the environment, pollution effects, methods and equipment to detect pollution, pollution treatment, investment on pollution control and treatment, and legislation.

# INDUSTRIAL NEWS

## The Energy Crisis and Fuel Economy

by

C. G. Henson

### Introduction

Ever since the industrial revolution, man has been wasting an ever increasing amount of the world's energy resources. As production has increased, so has man's energy requirements. This has been met by the use of fossil fuels, originally produced by heat, pressure and decayed animal or vegetable matter, many millions of years ago, within the earth's crust.

Wood, then coal and now, natural gas and oil have been squandered away by man in reckless abandon in his greedy, groping path for wealth, without any regard to the requirements of future generations. Man's only regard to fuel was its economic 'use limit' at the time for any particular fuel employed. Now we are almost at full cycle, with the known sources of fuel oil and gas, rapidly coming to an end, with any presently unknown sources probable beyond the present economic production limit at current prices.

The situation is indeed serious, as although the total run-down period may be as much as 50 years hence, we are talking in terms of only 10 years when large scale shortages will have their effect in higher and still higher prices. This will, in turn, cause the private sector to severely restrict the use of vehicles with increased public transport, providing the user can afford to pay the increasing charges, and with small industries not being able to carry on, the whole industrial complex will finally grind to a standstill.

Some would say that this is too pessimistic a view, but just consider the following:

1. America used to be the principal exporter of oil. She is now one of the principal importers and is even importing from Russia. Russia in turn is now an importer of oil from the Middle East.

2. North Sea gas and oil is being exploited by many surrounding countries but at an ever increasing cost and there are doubts as to the magnitude of the reserves.
3. The main oil producing countries are in the Middle East and the African Continent. These countries are not yet industrialised sufficiently for the manufacturing countries (the oil user countries) to sell or trade much in the way of goods or materials for oil. Hence the oil producing countries have, literally, the oil consuming countries 'over the oil barrel', as far as price is concerned.

### Alternative Fuels

Atomic energy still has its troubles and indeed, not all scientists are agreed on the safety of atomic-fuelled power stations. Any leakage of plutonium could wipe out large sections of the population and still leave an effect for thousands of years to come. It will therefore, be many years before atomic energy takes over man's increasing requirements.

Solar energy is in its infancy and a radical breakthrough in technology will be required, if we are to see much benefit from this source in under 50 years.

Geo-thermal energy is also being examined, but where this phenomena occurs is normally away from the power requirements and the amount of energy to be got out of these sites may not prove to be much, in relation to the energy requirements at the time when energy can flow from them.

The main alternative fuel, of which there is still an abundance in most industrial countries, is coal and, with the increasing cost of oil and gas, becoming more economical. In the light of modern combustion technology,

environmentalists need not be alarmed at the thought. Coal need not be burnt *ad lib.*, as in the past, but its main derivatives such as coke, gas and even coal tar oils can be made to burn for a variety of uses without pollution problems, providing advantage is taken of the latest technology and pyro-chemical compounds now available on the market.

Taking a broader view, there are a number of waste products which could be harnessed, even in this country, as a source of heat or power. Take incineration as an example. A number of Local Authorities are already installing large communal incinerators to burn normal household and industrial wastes, but in many cases no use is being made of the potential energy which could be extracted from them.

Sewage gas is another example and whilst there are a number of sewage plants where digestion tanks have been installed in this country, thus gaining sufficient power from the gas to run the pumping plant, there are still a number of places where this could be taken up and where energy could be exported to users outside the confines of the plant. When the writer was involved with this many years ago, the economic factor was a township of approximately 50,000 people, producing 1 cu. ft. of gas per day per head or, where a goodly part was industrial, 0.75 cu. ft. per head per day.

However, just plain economics should not now hold up the various schemes shelved in those days. They should be resurrected and re-examined, consideration being given to combining with other schemes, over council boundaries, in order to see whether a substitution for energy can be gained. An added advantage in getting these schemes going would be to reduce pollution of land and water, particularly around these shores

where, in some places, the pollution is said to be at a dangerous level to health.

Again, in other countries there are a number of waste fuels which could be used to relieve the use of major fuels. Until quite recently, these waste fuels were being used in large quantities, but the advent of the so-called clean fuels such as oil, bringing with them lower maintenance costs and a lower manpower requirement, have gradually replaced them. Waste products such as cotton seed husks, sisal and other vegetable matter can provide producer gas or be burnt to provide heat. The writer was involved in this work many years ago and, in fact, even a diesel engine was run for some time on part producer gas from cotton seed husk, with pilot ignition from the oil expressed from the cotton seed. With modern technology, there is no reason to suppose that even more of this could not be done to conserve the major fuels.

So much for industrial and household energy requirements. What can be done in the way of road transport? Not so many years ago, cars and buses were run on producer gas and even now, at least one local authority is still running some vehicles on sewage gas. There is no earthly, viable reason why a motorist could not fill up a gas bag or container from sewage stations or other such places, providing a compressor was installed. Taking this further, petrol stations could easily be fitted out with compressed gas tanks. Vehicles have also been run with their own little producer plant attached to the rear using solid fuel and recently a car has been on a number of demonstration runs using chicken manure.

Electric vehicles with satisfactory loading capacity will be a long time in coming, unless there is a breakthrough in battery technology, as the weight of the battery at present devised and which is necessary for long distance travelling, precludes any economic power-to-weight ratio.

### Fuel Economy

What can we do to help in this energy crisis where alternative sources are not available? We can and must practice fuel economy. It is the duty of everyone, large or small user, from the private motorist to the large fleet user, householders to large office block owners and from the small industrialist to the large industrial company, to practice fuel economy now, not tomorrow or next day, but NOW.

One must bear in mind that petroleum fuels are being used in ever-increasing quantities to keep step with increasing production throughout the world and, even if we stood still on our present requirements, there is just not that amount of fuel available for any great length of time.

Every day, millions of gallons of fuel oil and millions of cubic feet of natural gas are still being wasted, mainly due to poor combustion resulting in air pollution and excessive maintenance costs, not only in this country, but all over the world. For a start, the following points could be heeded:

1. Every user of energy should see that his plant operators have the necessary training and proper instrumentation to hand, in order to ensure the highest combustion efficiency being maintained in his plant.
2. A firm of fuel economy consultants should be called in to vet the energy requirements of the user. These are specialists and by investigating the correct fuel or energy form for the job on hand, can more than pay for their fees.
3. Fuel additives, which give proven fuel economies, should be investigated and used wherever applicable.

### Conclusions

It is considered that the United Nations should set up a fuel economy section to examine the requirements of each country for energy potential. In addition, to set up technical teams of specialists in every field of energy, cutting across manufacturers or suppliers cartels and boundaries, price rings, etc., so as to make the greatest possible use of fuels readily available at present and to examine new sources of energy.

The cost of doing this will just have to be accepted by all the countries concerned as otherwise life could just grind to a halt, at least in its present concept of high industrialisation.

All this would, of course, take time to materialise and in the meantime, the three basic points set out earlier could at least be implemented by every user. As far as plant efficiency is concerned it should be realised that pollution is a waste of fuel, bad maintenance is a waste of fuel and if everyone took notice of these two

facts alone, a distinct saving of fuel would result.

Secondly, fuel economy consultants are specialists and they are out to do a job of work. They have the time and know-how, to 'see the wood from the trees', whereas user firms are taken up with more and more production—the choice of fuel or use of a fuel being taken as just a necessary evil or means to an end. One such firm dealing with fuel economy in the Oldham area is reported to have saved many firms thousands of pounds in the first year alone and they are going from strength to strength.

Thirdly, as far as additives are concerned, the one which is showing the greatest results in the writers' opinion, is that marketed under the name of 'Rolfite'. This patented and sophisticated product not only counteracts the various corrosion and pollution problems associated with the burning of fossil fuels, but establishes a definite fuel economy of such a degree, as to more than recover its own cost, even in very high efficiency boilers and to provide a very real nett saving in fuel costs with lower efficiency plants.

The latest product, based on the original patented nitrogenous manganese complex, includes another organic metal salt and a controlled size of magnesium oxide particle which is completely held in suspension. This form of product is dosed into a fuel oil line to the burner, mixing intimately with each droplet of oil and hence dispersing uniformly within the flame envelope.

In recent tests, both here and in the United States with very large, high efficiency boilers, this latest product has established considerable reductions in soot acidity, dust carry-over burden and hence acid smutting, with an increase in efficiency large enough to cover the cost, to say nothing of the additional savings accrued from lower maintenance costs.

Similarly in gas-fired furnaces, this basic pyro-chemical has enabled natural gas to be fired at or near stoichiometric balance with air, showing a gas saving in addition to counteracting the effects from oxidation in some processes.

Again, in the automotive field, this patented complex has shown proven fuel savings with less pollution and cleaner engines, both diesel and petrol. Lower octane petrols can safely be used with this additive, even in the higher compression range.

Finally, it behoves everyone of us to really consider what we can do, right now, in the conservation of fuel supplies, whatever type is used. It must be remembered that a saving in lubricating oil will also reflect a saving in fuel supplies and the possibility of using vegetable oils for many more lubricating requirements than hitherto, should also be investigated.

Diesel operators can effect savings not only in fuel, but in lube-oil changes by the use of the above mentioned additive. Similarly, petrol engine users can effect lube-oil savings, but should also run their vehicles on the lowest practicable octane petrol, with as lean a mixture as is possible.

Boiler or furnace operators should continually take note of any ingress of air through leaks in brickwork or hand-holes, sealing them up immediately, not putting this off until some other time. Holes will not seal themselves and will only get larger, causing an ever increasing waste of fuel through excessive tramp air.

Last, but not least, all storage tanks of fuel oil should be thoroughly inspected for rust damage, leakage and sludge, remembering 'that a stitch in time saves nine'. Also, that it is not necessary these days to steam-clean storage tanks. Better to emulsify any sludge by the use of an additive, such as the one mentioned and burn the sludge thus saving fuel, otherwise wasted.

#### Spot-Checks on Air Pollution, or Continuous Monitoring, are Easier With New Low-Cost Portable Units

A new range of portable, low-cost carbon-monoxide monitors, designed for making quick spot-checks or continuous monitoring of air pollution, is announced by Analysis Automation Ltd of Oxford, specialists in the field of analytical instruments.

Six versions of this small, light-weight monitor, called the Ecolyzer are distributed in the UK by Analysis Automation and they cost less than half the price of equipment of comparable accuracy currently believed to be available.

Easy to operate and powered by integral batteries or an AC mains supply, the Ecolyzer incorporates an electrochemical sensor which is believed to be unique.

In operation the Ecolyzer draws ambient air through a detector cell where it passes over the catalytically-active diffusion electrode. Any carbon-

monoxide present is oxidised to carbon-dioxide. The rate of oxidation is related to the concentration of CO, and can be read directly from the meter. Humidity and water vapour in the air do not affect the performance of the Ecolyzer. Accuracy is maintained over a temperature range of 0° to 40° Centigrade.

The Ecolyzer is suitable for many different applications, including the continuous monitoring of urban areas as well as restricted areas such as tunnels, factories, bus depots, underground car-parks and coal-mines. Industrial applications range from warehouses and factories where fork-lift trucks generate carbon-monoxide to mills and foundries with CO-producing furnaces.

In the medical field, the Ecolyzer can be used by cardiopulmonary experts to detect in the atmosphere significant amounts of carbon-monoxide which can reduce the ability of the bloodstream to carry oxygen to body tissues. The toxicity of carbon-monoxide and the high concentrations that can occur emphasize the need for more information on its generation and distribution in the environment, say Analysis Automation.

A feature of the Ecolyzer is its portability which permits fast vertical plotting of the varying levels of carbon monoxide by spot-checking at different heights in cities.

Reader Enquiry Service No. 7381

#### Calor Gas Research into Dual Fuel Mixing Systems

##### The Basic Problem

All diesel engines smoke under conditions requiring maximum power when there is inadequate fuel-air mixing. This occurs in any situation where the driver's foot goes down to the floor quickly, before the engine has picked up speed, such as pulling away under heavy load, heavy acceleration, or climbing hills. Badly maintained engines produce even more smoke under these conditions.

##### The Theoretical Answer

It has been known for years that mixing in a proportion of lighter distillation products, such as Calor Propane, can give improved performance and reduce smoke, by ensuring complete combustion. This is only the case during maximum fuel demand, not during cruising.

The improved combustion produced by the addition of Calor Propane would also result in the emission of much cleaner exhaust since reduction in Carbon Monoxide, oxides of nitrogen and sulphur content takes place.

However, if Propane is not added in the correct quantities the engine can be damaged by over-revving and over loading of the bearings.

##### The Dual Fuel Process

The operation of a diesel engine on dual fuel using Calor Propane as the secondary fuel improves fuel/air mixing enormously since it can be mixed with air before entering the combustion chamber. The total quantity of fuel supplied to the engine remains roughly the same as it was with diesel alone, the best emission results are obtained when 70% diesel 30% Calor Propane proportion is used. Calor Propane, equal in heat content to the replaced diesel, pre-mixed with air restores engine power without smoke emission.

The system only comes into action at moments of maximum fuel demand when maximum power is needed. If the Calor Propane cylinder is allowed to run dry, the system automatically reverts to full diesel supply.

##### Practical Results

The static testing of the Calor Dual Fuel mixing system has confirmed that at a 71.7% diesel/28.3% Propane ratio the smoke number is halved. Also at this level the oxides of nitrogen have been reduced by almost 20% and the carbon monoxide by as much as 40%. On a larger engine with a ratio of 70/30 the smoke previously unacceptable was virtually eliminated.

The system has now been Road Tested on vehicles on the Calor fleet with a total of over a half a million miles successfully completed.

These tests showed that on average if previously the engine has used one gallon of diesel for 10 miles this would be replaced by 0.8 gal diesel and 0.2 gal Propane. Based on these figures running costs would become, for example:

Previous cost 1 gal diesel @	
30p/gal	.. .. .
New Cost 0.8 gal diesel @	
30p/gal	.. .. .
0.2 Calor Propane @ say 23p	.. .. .
	24p
	4.6p
Total	28.6p

Saving 1.4p per gal or 4.7%

The prices used will vary according to the size of the operator.

The use of L.P.G. as a secondary fuel cannot be used in those high speed diesel engines with a precombustion chambers because rough combustion results. The large automotive diesels are those which will benefit most from the Calor Gas system.

Calor Gas have applied for a Patent to cover this system.

Reader Enquiry Service No. 7382

### U.S. Mail Will Use British Electric Vehicles

Mr Tom Martin, Transport Controller for the Western Region of US Mail, was recently in England to see Harbilt Electric Trucks & Vehicles, who are to supply 30 of their most modern design of electric delivery vehicle for mail distribution in the state of California.



Mr Martin, who is responsible for the operations of 34,000 mail delivery vehicles in his region, is a great enthusiast for electrics on both economy and ecology grounds. He says he has chosen a British design because of our proven technology, which is far in advance of America in this field. He likes electrics because they are cheap to run and require very little maintenance, which both add up to a large saving in dollar expenditure. Moreover they produce no noxious exhaust gases to add to the already heavily polluted air in Southern California, so they help to improve the quality of life.

The vehicles that are going to America are from the latest Harbilt Electric HSV range, they are driven by a 12½ h.p. electric motor which is powered by a 72 volt lead acid battery. Reader Enquiry Service No. 7383

### Bendix Series 8100 NO, NO<sub>2</sub>, NO<sub>x</sub> Analyser

The new Bendix Series 8100 Analyser provides a simple, accurate and fast means of measuring the oxides of nitrogen—NO, NO<sub>2</sub> and NO<sub>x</sub>—both in ambient air and gaseous mixtures.

Designed for a wide variety of applications, including smog measurements and research into internal combustion and jet engine exhaust emissions, the 8100 Analyser works on the principle of photometric detection of the chemiluminescence resulting from the reaction of NO in the sample with ozone, producing NO<sub>2</sub> + hv.

Ozone is produced by a small internal generator connected to an external oxygen supply. An automatic shut-down facility is provided in case of oxygen supply failure, or low oxygen pressure.

Trace monitoring of NO<sub>x</sub> is carried out by means of a solid state, temperature-controlled NO<sub>2</sub>-to-NO converter in the sample inlet flow. NO<sub>2</sub> measurement is accomplished by alternately comparing the analysis of NO bypassing the converter and NO as NO<sub>x</sub> passing through the converter. Memory circuits enable continuous readout of NO, NO<sub>2</sub> and NO<sub>x</sub> levels.

The photomultiplier tube fitted to the Series 8100 is thermoelectrically cooled and controlled in order to maintain stable zero output and low level dark current.

Other features of the instrument include external sample pump, front panel controls and solid state circuitry. Reader Enquiry Service No. 7384

### Mikropul Plant to Control Coal Dust Pollution in India

Mikropul Ltd. have received an order to supply dust collection equipment to control and collect fine dust arising from a coal grinding plant in India. The contract is for the first stage of the project and is valued at £45,000 which involves Mikropul providing Mikro-Pulsaire reverse-jet dust collectors and associated engineering services.

At several other stages of the plant dust control equipment will be necessary in which Mikropul equipment will be specified.

The Mikro-Pulsaire is the world's first reverse-jet continuous air filter, and has become established in many industrial situations throughout the world where dust is a problem because it either constitutes a nuisance in polluting the atmosphere or represents a loss of valuable product or often both.

Reader Enquiry Service No. 7385

### National Engineering Laboratory and Shell Research Ltd. Announce 'Vapipe'—New British Invention Substantially Reduces Car Pollution

A new technology for substantially reducing the emission of noxious gases from motor vehicles was announced recently by the Department of Trade and Industry's National Engineering Laboratory.

This new development—VAPIPE—is the result of 2½ years' intensive research by the National Engineering Laboratory working in close collaboration with Shell Research Limited. It represents an important technological breakthrough and gives Britain a significant lead in an area in which the world's motor car industries have invested in large research programmes.

Research in both the UK and overseas reflects the growing awareness of the problem of exhaust pollution caused by the increasing number of motor vehicles in use. VAPIPE offers a valuable contribution to the solution of this problem. Its development is of major significance not only from the environmental point of view but also for the technological and export opportunities which it offers the UK, particularly in the American market where the introduction of legislation limiting the permissible levels of exhaust pollutants is already well advanced.

### How VAPIPE works

VAPIPE tackles the problem at source. Low levels of pollution are obtained by minimising the creation of unburnt carbon monoxide and oxides of nitrogen in the engine cylinders. This is done by using a weaker mixture of air and petrol than is used in a conventional engine. The VAPIPE ensures that the petrol is completely vaporised so that the air/fuel mixture fed to each cylinder is identical. Without it, the use of very lean mixtures is not a practical proposition and other methods have to be used to deal with the pollutants created in the engine through the conventional combustion of a normal fuel/air mixture.

The VAPIPE is a heat pipe vaporiser, the heat pipe being a compact high-conductivity heat exchanger consisting of a metal tube containing a liquid and its vapour.

In use, waste heat from the exhaust gases heats the lower part of the tube causing the liquid to boil before condensing in the upper, cooler, part of the heat pipe. Heat given out by the condensing liquid is thus available to evaporate petrol in the fuel/air mixture before it enters the cylinders. The condensed liquid returns by gravity to the base of the heat pipe, this cycle being continuously repeated and maintaining a steady evaporation of the fuel.

Test bed experiments on cars indicated that reductions in emissions of carbon monoxide and oxides of nitrogen in the region of 70 per cent and 90 per cent respectively are attained. Road tests on two standard production saloon cars fitted with VAPIPE show that these results are also achieved under normal operating conditions.

Shell Research Limited and the National Engineering Laboratory have filed patent applications throughout the world and will jointly be pursuing the commercial opportunities which VAPIPE offers.

### TI Silencer Group and British Leyland Co-operate on Anti-Pollution Exhaust Systems

British Leyland have announced their intention to appoint Cheswick and Wright, a member company of the TI Silencer Group, a major supplier of catalyst assemblies for exhaust systems for the British Leyland Group, including Austin Morris Division and the Specialist Jaguar, Rover and Triumph Division.

From the 1st January, 1975, all cars exported from Britain to California, will have to be fitted with an emission control device in the exhaust system in order to maintain the emission level of toxic fumes within the regulations laid down by the U.S. Environmental Protection Agency. These regulations will govern the volume of unburnt hydrocarbons and carbon monoxide emitted into the atmosphere. On the 1st January, 1976, these regulations may well be applied across the US, with further curbs on emission including oxides of nitrogen.

British Leyland have been holding discussions with the TI Silencer Group engineers on the problems of meeting the E.P.A. regulations and overcoming the chemical and technical problems laid down by this legislation. Development work has been carried out on alternative methods to encapsulate the chemical catalyst within the exhaust system so that the system and catalyst perform to the stringent standards required. One of the main problems has been providing sufficient internal support for the catalyst to ensure a satisfactory life.

Cheswick and Wright has, over the last three years, carried out considerable research and development in catalyst encapsulation and is at an advanced stage in planning new production facilities capable of handling the expensive platinum coated catalyst and fabricating silencer parts in stainless steel. The British Leyland appointment is the first granted to TI Silencer Group as a result of this development work. At the Group's engineering centre at Blackpool, more than £60,000 has already been spent on anti-pollution test equipment.

The E.P.A. regulations will apply to all exporters of motor cars to the U.S. and the TI Silencer Group is currently carrying out development programmes on catalyst encapsulation for many British and Western European manufacturers.

A new 4 page, A4 publication from Cheswick & Wright Ltd of Blackpool describes their new anti-pollution laboratory—the first to be established in Europe by a specialist motor vehicle exhaust system manufacturer. This new facility is already contributing to the Company's efforts in the development of anti-pollution devices. It adds significantly to the total exhaust systems service offered by Cheswick & Wright for motor car and commercial vehicle manufacturers.

The exhaust system test capability, which ranges from anti-pollution devices through corrosion resistance and fatigue testing to noise control, will enable the company to engineer complete systems to satisfy exacting environmental and production requirements.

Copies of the new booklet, which includes colour illustrations of exhaust analysis tests in progress and also features four of the key executives involved, are freely available in English, French, German, Italian and Swedish from:

Director of Marketing Services,  
TI Silencer Services Ltd, Squires Gate  
Lane, Blackpool, Lancashire. FY4  
3RN.

Reader Enquiry Service No. 7386

### New Fuel Reduces Sulphur Contamination and Pollution

Conoco is producing a low sulphur gas oil at its Humberside refinery in Lincolnshire with the aid of a £300,000 sulphur recovery unit.

The gas oil has a lower sulphur content than most other gas oils and far less sulphur than alternative fuels such as coal and heavier fuel oils.

Sulphur in fuel oil is responsible for a number of undesirable and costly effects such as corrosion of combustion chambers, boiler flue ways and stacks. It also reduces efficiency of the combustion process itself.

With industries where the products of combustion are in direct contact with the manufactured article, sulphur causes contamination and a significantly higher rejection rate. Industries susceptible to this include ceramic and glass production, brickworks, metal forging, and grain drying.

In places like foundries where the products of combustion may enter the area where people work, sulphur can also be a health hazard.

Apart from the manufacturing difficulties caused by fuel with high sulphur content, there is the environmental problem of air pollution. With nearly six million tons of sulphur dioxide being discharged into the atmosphere in Britain each year, the importance of reducing sulphur emissions is paramount.



Explaining the solutions to the problem, Mr. Ken Potter, Director, Industrial Marketing, Conoco Limited, said:

"Systems are available for removing sulphur from flue gases but they are expensive to install. The most sensible solution is to remove the sulphur from the fuel before it is burnt."

Conoco's unit, which recovers 50 tons of pure sulphur every day, is the final step in the company's programme for the removal and separation of the sulphur in petrol, diesel oils, home heating oil and gas oil.  
Reader Enquiry Service No. 7387

# **A BEAUVENT ECONOFLU STEEL CHIMNEY WITH AERODYNAMIC HELICAL STABILISERS AND AN INNER BEAUVENT INSULATED STEEL LINER**

53 m high  $\times$  2000 mm diameter  
58 m above ground level erected  
to serve the No. 6 Coil Boiler at  
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This BEAUVENT chimney is one  
of a series of six steel chimneys  
being manufactured, transported  
and erected by F. E. Beaumont  
Ltd at the Thames Refinery  
between 1969 and 1973

*Photograph by courtesy of Messrs. Tate & Lyle  
Refineries Ltd.*

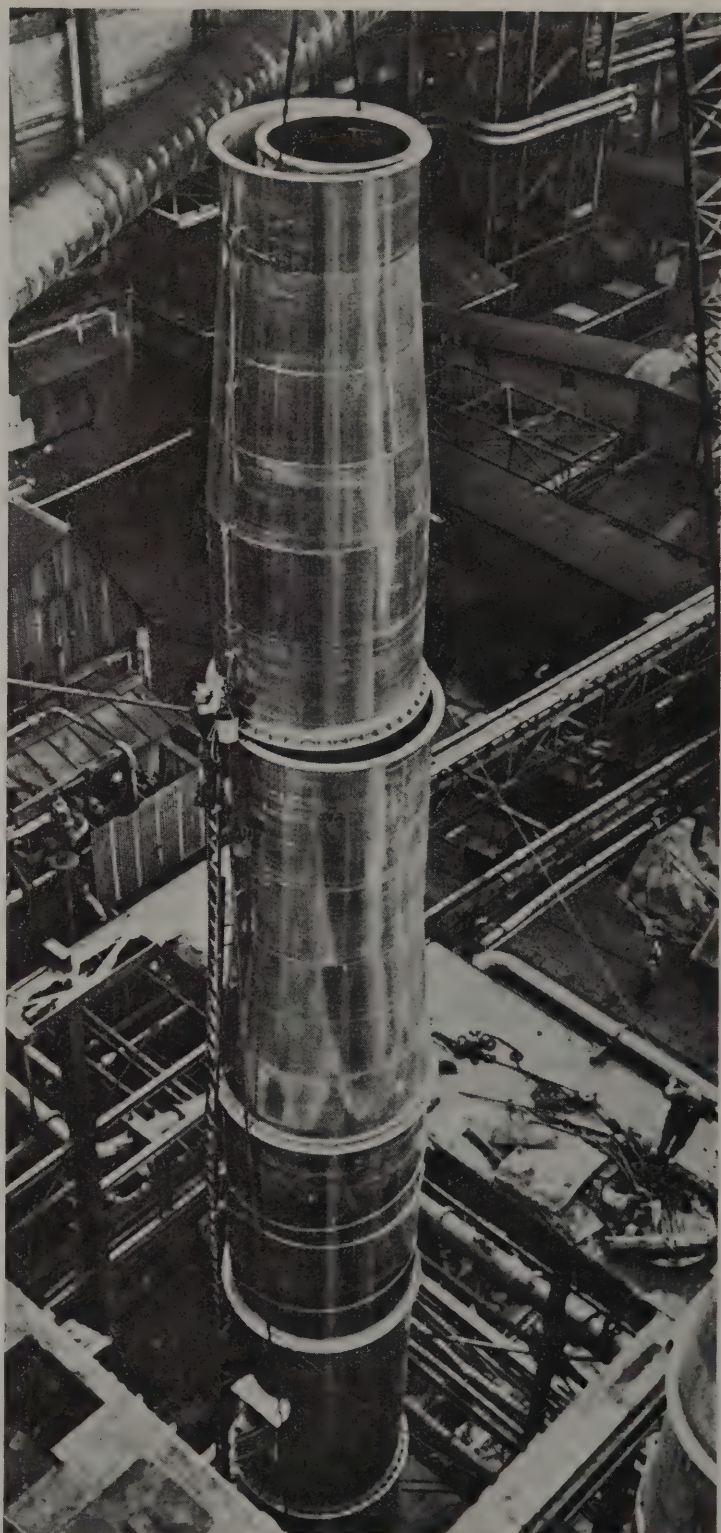


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Reader Enquiry Service No. 7388



# CLEAN AIR

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136 North Street, Brighton BN1 1ZY  
(Registered Office - Registered in England 594680)

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# The most versatile answer to gas carried pollution.

Lodge-Cottrell electrical precipitators combine high efficiency performance with low running costs and provide a versatile method of dust collection from coarse particles down to sub-micron fume.

The electro-static principle involved enables use over a wide range of temperature, pressure and dust burden inlet conditions, with almost negligible pressure loss and operating efficiencies up to 99.99%.

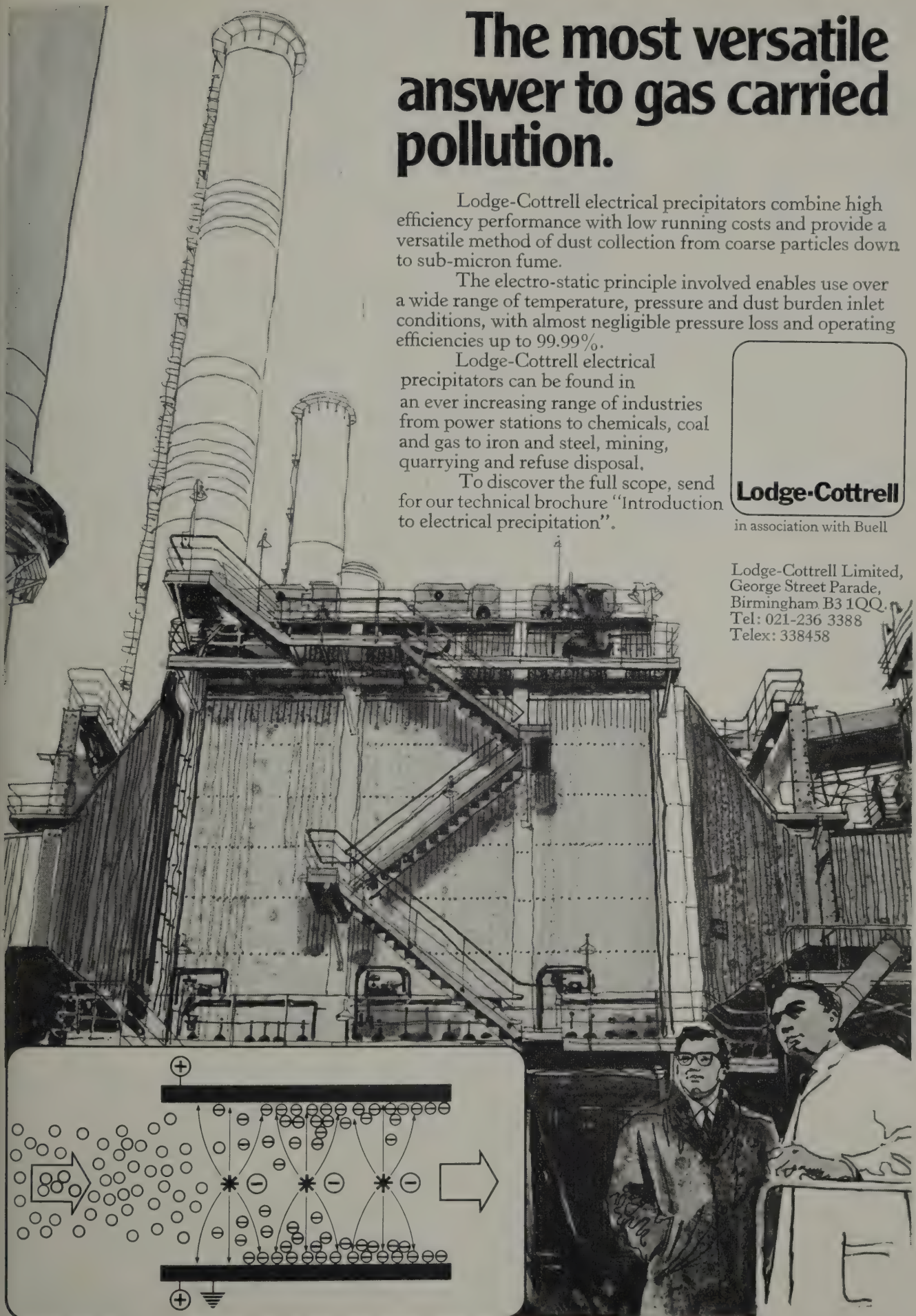
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**BRITAIN'S LEADING AIR POLLUTION JOURNAL**

# **CLEAN AIR**

*Incorporating "Smokeless Air"*

**WINTER 1973**

**VOL. 3 NO. 12**

## **PRINCIPAL CONTENTS**

**Torquay Conference**

**Opening Address, Donald Davies**

**Presidential Address, H. B.  
Greenborough**

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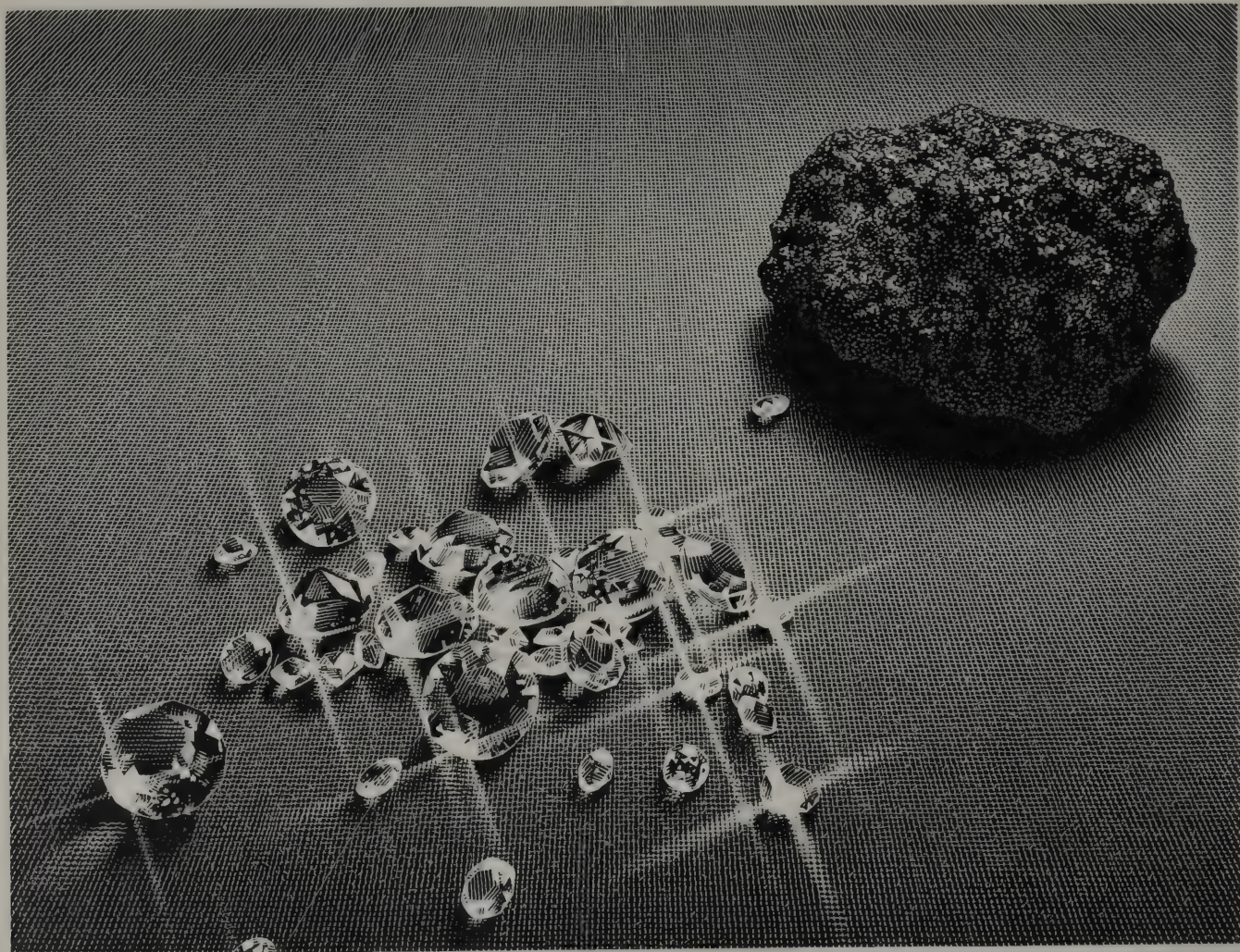
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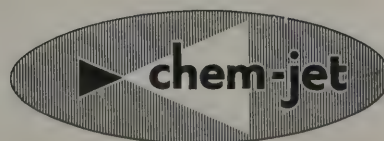
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# CLEAN AIR

## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

Vol. 3 No. 12

Winter 1973

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"This most excellent canopy, the air"

# CLEAN AIR

## Local Authorities and their Place in the Society

In the last issue of this journal members were advised about the proposed reconstruction of the Society. These changes, which have been approved by the Council of the Society, have now been ratified by the Society's solicitors and a new Memorandum of Association, Articles of Association and Bye-laws drafted to embody them. The new "Green Book" has been forwarded to the Department of Trade and Industry for approval, and once this has been obtained it will be possible for the changes to be promulgated individually to every member of the Society together with a notice of an Extraordinary General Meeting. Indeed, by the time that this issue of "Clean Air" has been received by members, it is expected that notices about the General Meeting will have been despatched.

As was stated in our last number, the changes in the local government map and the creation of the new district councils will have a profound effect on the local authority membership of the Society, and every effort is being made to encourage all the new local authorities to become members. Letters have already been sent to the Chief Executives of all the new authorities in England and Wales inviting their authorities to join the Society. What we now seek is help from all our existing members, and especially local authority members, in helping to implement this effort.

At present 507 "old" local authorities in England and Wales are members of the Society. Such authorities include on the one hand the Greater London Council and on the other the Rural District Council of Atherstone. Some County Councils, most County Boroughs, many Boroughs, many Urban District Councils and some Rural District Councils are members. But of course, there are gaps, gaps which we have tried to fill over the years.

But current reorganisation means change. In 1974 there will be many new authorities; some authorities will continue in a different form but with the same name; others will continue in much the same form with a new name; some will join with others and be absorbed in the new districts. Many so affected are already members of the Society and it will be a rare case if one of the "components" of a new authority is not already a member. For example, the City of Birmingham is a member; the new Metropolitan District of Birmingham, it is hoped, will continue as a member in its new form. The City of Leeds is a member; again it is hoped that the New Metropolitan District of Leeds will continue its membership and include all those smaller authorities on the periphery that the new district will absorb. Obviously, many of the smaller local authority members of the Society will be absorbed in such a way and their membership of the Society cease at the end of March, 1974. To such authorities we would like to extend our thanks for their support over the years and hope that they will be able to continue their activities within their new district. But in other cases, anomalies may well arise. It may be that within a new district authority, the larger existing authority is not at present a member of the Society although an Urban District Council and Rural District Council on its periphery, which will be absorbed by the new district, are members. Here the position is not so straightforward, but it is sincerely hoped that these old members of the Society will be able to use their influence in the new district to see that membership is continued.

There will be anomalies, too, in another way. Some of the new districts will embrace authorities who have initiated and are carrying out smoke control programmes side by side with authorities who have not yet made a start. Some so called "black" authorities will absorb "white" authorities and vice versa. The new Local Government Act has firmly stated that the responsibility for clean air will be with the new district councils. Other changes mean that the public health inspector will become the Environmental Health Officer; and the former chief public health inspector will now, as the Chief Environmental Health Officer become an executive officer. Some of the legislation about to be introduced into Parliament in the Protection of the Environment Bill, which it is hoped will become law by the middle of next year, will place even more responsibilities for the control of pollution generally on the shoulders of the new district councils. Here, the Society is in a position to help and advise.

But there are still more changes. In future, education will be the concern of the Counties and the Metropolitan Counties. Much of the Society's present work in providing information is to schools and other educational establishments and direct to school children and students. Obviously, the Society makes no charge to children and students for the information with which they are supplied, and it is rare that any charge is made to a school or education authority. This work with children and students is of extreme importance and takes more and more of our time. But it is time well spent; it is essential that future generations are taught not only the three R's but also about the environment, about the control of pollution and the part that they, as citizens of the future, can play in securing the environment in which they would like to live. It is therefore important, from the point of view of the new education authorities that the Counties and Metropolitan Counties should also be members of the Society. We hope that it will be possible for all authorities responsible for education to support the Society and in so doing help us not only to continue but also to increase our service to schools and other educational establishments and to students and children.

Our aim is that every one of the new local authorities should be a member of the Society. We ask the help of all present members of the Society to enable us to achieve this goal.

## TORQUAY CONFERENCE

Everyone went to Torquay certain that our luck with the weather would change again and that we would be favoured with glorious sunshine and gentle winds. In the event we were not so fortunate and had some very heavy rain and strong, cold winds. Nevertheless the weather did not interfere with any of the Conference activities and on the Wednesday afternoon when some were playing golf and others were visiting Exeter, Brixham, Plymouth and Hinckley Point the weather was kind.

The Conference was very well attended and there was an increase on the number of full time registrations over that of last year. All sessions were well supported and the papers presented were generally of a very high order. The experiment whereby the number of papers presented was reduced was continued this year and again proved successful, although it is generally thought that there should always be at least two papers at any one session.

The Conference was opened on the Monday evening following the experiment started at Scarborough last year. This again, in spite of very heavy rain, proved to be a happy idea and the Town Hall at Torquay was comfortably full to hear the welcome from the Mayor of Torquay, Councillor D. G. Damerell, the Opening Address by Mr. Donald Davies and the Presidential Address from Mr. H. B. Greenborough.

The Conference was to have been opened by Mr. Derek Ezra, the Chairman of the National Coal Board,

but very unfortunately about fourteen days before the opening date, Mr. Ezra was taken ill and had to cancel all his engagements. Because of this, his place was taken by Mr. Donald Davies, the Board member for Marketing of the N.C.B. and he stepped into the breach at very short notice and got the Conference off to a very good start. The full text of his address is given later in this issue. Mr. Greenborough gave a very fine Presidential Address and this again is published in full in this journal.

The Tuesday afternoon followed the pattern of previous years and took the form of a open session organized by the South West Division. The Chair was taken by Alderman C. Hebblethwaite, C.B.E., the Chairman of the South West Division, and the principal speakers were Lady Sayer, Past Chairman of the Dartmoor Preservation Association and Mr. Phipps Turnbull the Devon County Planning Officer. Lady Sayer spoke of the necessity of preserving the amenities of Dartmoor and Mr. Turnbull presented the point of view that the South West was an area which was rapidly developing and would need better roads and transport facilities. An interesting discussion followed but unfortunately Lady Sayer had to leave early to catch a train and so was unable to hear all the various comments.

As a result of the discussion which arose from the paper on smoke control presented by Mrs. Angela Moss



*The Conference in session*

at the Session on Tuesday morning, the following Resolution was passed on the Friday morning:

"This Clean Air Conference being satisfied that the definition "Black Areas" is out-dated and that air pollution by smoke is more related to population than industrialisation, urges H.M. Government to:

- (a) Abandon the concept of "Black Areas".
- (b) Encourage vigorously all local authorities to promote Smoke Control Areas without restrictions."

This Resolution was sent to the Secretary of the Clean Air Council.

Although the social side of the Conference tended to follow the pattern established in previous years, there were a number of departures from previous programmes. There was no informal "get together" as such on the Monday evening but this in fact did take place following the Opening Session. On the Tuesday evening, the Mayor and Corporation of Torquay entertained delegates to a cocktail party at the Town Hall and this was a very happy occasion. For those delegates and their friends



*Pollution! Pollution! Pollution!*

was followed immediately by the Conference Dinner and Dance which proved to be a most enjoyable occasion. The principal guest was the Mayor who proposed the toast of the Society. The reply was made by the Chairman of the Society, Mr. Combey, who literally "sang for his supper" instead of making the more usual speech. This innovation was well received by all those present.

## Visit to Hinkley Point Power Station

A party of delegates left Torquay at 9.30 on the morning of Wednesday, 17th October, to visit the Hinkley Point 'A' Power Station which is on the Somerset coast on the south side of Bridgwater Bay at about five miles west of the River Parrett.

The total area of the site is 164 acres and the power station has a net output of 500,000 kilowatts, a plant consisting of two natural uranium carbon dioxide gas-cooled reactors supplying heat to 12 boilers. The total steam production is about 5½ million pounds/hour and this supplies six main turbo-alternators, each of 93,500 kilowatts maximum rating, and three variable speed turbine-generators which provide power for the gas circulator drives.

Each reactor core contains 4,500 fuel channels, the fuel elements being uranium rods just over one inch in diameter and sheathed in magnesium alloy.

On arrival at the power station the party received an introductory talk for about an hour prior to being entertained to an excellent buffet lunch. Following this the party were divided up into a number of small groups and were shown all over the station. One of the things which struck delegates was that the power station was most unusual as all that can be seen on arrival are two huge glass structures, no railway sidings, no incoming coal lorries, no condensing towers. One point of interest was that although the station was commissioned over six years ago, the reactors still contain a great amount of the second load of fuel.

This was a most interesting visit and much enjoyed by all those who were able to take part in it.



*The Mayor speaks at the Dinner*

who did not wish to attend the cocktail party, theatre tickets were available and many delegates availed themselves of this facility. The Wednesday afternoon was taken up with technical and other visits and with the golf and tennis competitions.

This year the Wednesday evening was deliberately kept clear so that delegates would have time to pursue their own particular interests and activities. On the Thursday evening the Chairman of the Executive Council, Mr. W. Combey gave the customary reception at the Grand Hotel and in addition to the particular guests invited asked all those who were attending the Conference Dinner to attend his reception as well. This made for a very large and jolly party and was much enjoyed. The Chairman's Reception

### Technical Visit to Brixham Laboratory, I.C.I. Ltd.

As twenty-nine delegates stopped at a blue-washed building on the water-front bright sunshine ensured that Brixham lived up to its reputation for being set in a beauty spot and noted for its fishing.

The building, unexpectedly, was the I.C.I. Ltd. Laboratory and Consultancy Service on the Treatment and Disposal of Liquid Wastes. Even more surprising was the 'fishing' which was taking place inside.

Advance indication of the intensive use of the Laboratory came from Assistant Manager, Mr. C. R. Pearson, who boarded the bus to welcome the party because there was insufficient room to get everyone together inside.

Apologising for the unavoidable absence of Dr. P. M. J. Chipperfield, the Laboratory Manager, Mr. Pearson said the work of the Laboratory was partly treatment—advising on methods of dealing with effluents at factories—and partly marine work to control the discharge of effluents to the environment. Mr. Pearson said the effect of a pollutant could be reduced either by moving the point of discharge or by reducing the amount. Decisions on pollution levels were social, ecological and financial.

Members were shown the biological monitoring section in which the changes in types and numbers of sea-animals from given sampling points over a period of time is assessed, the bio-assay laboratory where both routine testing and rapid assays of the effects of effluents on fish are carried out, the analytical laboratory, the constant environment room where tests are made for the treatability of effluent samples and the semi-technical laboratory which houses a pilot plant for studying the removal of harmful chemicals from liquid wastes.

The intensive work being carried on in the laboratory by experts from many disciplines was most impressive. It is reassuring to see this effort being put into the assessment of possible dangers to the environment and the thanks of the Society are due to I.C.I. for the opportunity to visit these Laboratories.

### Technical Visit to the Incinerator Plant, Exeter.

Although the plant was not working at the time of the visit this did not detract from its value to the thirty delegates who attended. Not only was it possible to hear every word of explanation from Mr. J. Sture and Mr. G. Croucher but delegates with a special interest were able to clamber into the combustion chamber.

The Exeter Incinerator was commissioned in January 1970 being the sixth of its type to be put into operation in this country. It incorporates a German designed 'Martin' reverse acting grate which burns unsorted refuse at the rate of 90 tonnes per day. Once combustibles are burnt off the residue is quenched, tins are extracted and the remaining material is tipped.

Gases from the furnace are first passed through a conditioning tower where they are cooled by the injection of water, a process which incidentally removes about 270 kilogrammes dust/hour. They are further cleaned by means of an electrostatic precipitator with a design efficiency of 98.75 per cent. Discharge to the atmosphere is via a 61 metre stack and the dust burden in five gases is well within accepted limits.

### Technical Visit to U.K. Marine Biology Research Laboratory, Plymouth.

A party of 40 delegates and wives visited the U.K. Marine Biology Research Laboratory at Plymouth. The start of the journey was somewhat delayed due to the late arrival of the coach, however, good time was made on the route which passed through Paignton and Totnes. Upon arrival at the Laboratory the party was courteously received by Dr. Corner the Deputy Director who led them to the Lecture hall.

A most interesting talk was given by Dr. Whitfield, he started by explaining that there are four basic "spheres"—Atmosphere, Hydrosphere, Lithosphere and Biosphere, and that he was going to talk about Hydrosphere.

Dr Whitfield's talk discussed the composition of the ocean, its salinity and chemical composition. He illustrated his discourse with a number of slides which proceeded to simplify a most complex subject into every day terms which could be easily understood by all.

Dr Whitfield made the point that the ocean could accept and deal with all sorts of wastes and deposits but that it took time to carry out this process. It was probable that large scale pollution in a small area would cause local problems, but as the ocean is so vast, it does in time correct any imbalance.

Delegates were then invited to ask questions and a short but lively debate followed.

The party was then conducted around the Laboratories by Dr. Corner and shown some of the work which is being carried out. Dr. Corner informed the party that students came from all over the world to study and work at the Laboratory. The party also saw the library which contains over 70,000 books on the Biology of the ocean.

After a short break for tea in the Laboratory's common room Mr. Stanley E. Cohen thanked Dr. Corner, Dr. Whitfield and the staff of the Laboratory for their courtesy and patience in dealing with such a large party.

A brief visit was made to the Laboratory's very interesting aquarium but as time was short it was necessary to board the coach to return to Torquay.

All the party thoroughly enjoyed this most interesting visit and wished that they could have spent more time there.

### Ladies Cooking and Freezing Demonstration.

On Tuesday morning the ladies social programme got off to a good start with a gathering of over 100 ladies at the New Grand Hotel to watch a cooking and freezing demonstration by the South West Electricity Board. Plenty of tips on how to cook-freeze were given while many different tempting dishes were cooking in a Belling fan assisted oven. Among many things demonstrated was batch baking and after the lecture there was a very lively discussion.

This friendly and informal gathering was enjoyed by all the ladies and some I am sure are now very tempted to buy freezers.

### Ladies Home Gardening Demonstration.

On Thursday morning, the ladies congregated in the Churchill Suite of the New Grand Hotel for a demonstration on Home Gardening given by Mr. Davis of the Torbay Parks Department.

Mr. Davis gave a very interesting talk and demonstrated to the ladies how to pot, divide and propagate various types of houseplants as well as answering their questions and giving some very useful tips.

The ladies thoroughly enjoyed the morning which concluded with two raffles for houseplants and a distribution of cuttings from the plants Mr. Davis had been using for his demonstration.

#### **Social Visit to Exeter Cathedral**

On Wednesday afternoon a party of approximately 80 delegates and their wives left Torquay for a drive through the pleasant Devonshire countryside and a visit to Exeter Cathedral. They were taken on a conducted tour of this beautifully restored Cathedral where they saw some of the finest examples of Gothic architecture in the country and were able to listen to the Choir. Leaving the Cathedral and crossing the Square where a Roman Bath was being excavated the party enjoyed traditional Devonshire Cream Teas at Tinley's Cafe.

#### **Visit to Devon Leather Crafts, Newton Abbot.**

On Thursday afternoon a party of 30 visited Devon Leather Crafts where they were shown all the detailed work which goes into the making of leather goods. After the guided tour the party visited the factory shop where many bargains were made.

A short coach journey through the beautiful Devon countryside brought them to the Seymour Hotel in Totnes where an excellent cream tea was enjoyed by all.

#### **Visit to Buckfast Spinning Mills.**

On Thursday afternoon a party of about 40 people were taken on a guided tour of Buckfast Spinning Mills where they saw raw wool being sorted, cleaned, spun and dyed ready to be woven into Axminster carpets. After the tour the party were given the opportunity to visit the small shop in the grounds of the mills, where woollen goods of all kinds could be purchased. When everyone finished shopping the coach took us to Totnes, where at the Seymour Hotel everyone enjoyed cream teas, and then a short coach ride back to Torquay.

#### **Solid Smokeless Fuels Federation Golf Competition.**

The Golf Competition for the Solid Smokeless Fuels Federation Cup was played this year at the Torquay Golf Club. The rain earlier in the week had made some of the players a little apprehensive as to whether the competition would be held as on the Tuesday the course had been under water. Fortunately the weather improved, the sun shone and a good time was had by all, even those who did not play well.

The winner Mr. F. W. Marshall, a member of the National Coal Board staff in Yorkshire and the Regional Officer of the Solid Smokeless Fuels Federation, played in the competition for the first time and returned a score of 34 points.

Mr Marshall received the cup, which is returned for yearly competitions and the tankard which he retains, from the Mayoress of Torbay at the Conference Dinner and Dance.

#### **The British Gas Corporation Tennis Tournament.**

Once again a number of delegates braved the winds to take part in the tournament, held this year in the Abbey Park, Torquay. Strong winds seem to be a feature of these tournaments, and it is the more skilful players who are best able to control the ball, that come off best. Such was the case this year, when the winner from the previous three years, Derrick George, again displayed his expertise by coming out on top.

Mrs. Carol Farrow received the cup, kindly presented by the British Gas Corporation, on behalf of Mr. George the following evening at the Conference Dinner and Dance from the Mayoress of Torbay.



*Mr. R. Hollingdale presents the British Gas Corporation Cup to the Chairman Mr. W. Combey*

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And there are other good reasons .....

**The focal point:** the living fire supplies a fundamental human need. No house is really a home without it. Ask the family that has one. And the one that hasn't.

**Cheapness:** solid fuel, burned in an efficient modern appliance, is still the cheapest form of fixed heating.

**Round-the-clock heating:** solid fuel central heating never goes out, never lets the house chill completely off. And it gives you hot water into the bargain!

**Condensation and health:** the living fire provides natural, healthy ventilation. No stuffiness, no condensation.

**The fuel of the future:** the Government has embarked on a massive investment in the mining industry to safeguard supplies of fuel and power in the 80's. Already there is an abundance of all types of solid fuel for all types of appliances.

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If you are going smokeless, or if you have a modernisation programme, the SSFF can give you practical help with free design, estimates and specialist advice. We can also help you to keep your tenants informed by mounting free exhibitions and displays and by providing free literature.

We really can help you to help your neighbourhood come clean with solid fuel. Write or telephone for details of our completely free service.

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# The living fire comes clean!



# TORQUAY CONFERENCE

## Opening Address

by

**Donald Davies**

*Board Member for Marketing, the National Coal Board*



Mr President, Ladies and Gentlemen. First of all as you know it was going to be Mr Derek Ezra's pleasure to address you tonight. Unfortunately, he fell ill on the day before I started as a member of the National Board. I don't know whether there was any connection between the two things but I would hate to think that he was so shocked at the prospect of my joining him as a colleague that he had this rather unfortunate set-back. I am pleased to tell you, however, that Mr Ezra is making very good progress and he will be whipping us up to greater efforts within a matter of a few weeks.

I am particularly pleased that the choice did fall on me to address you tonight because this whole business of clean air and general environmental problems have taken a great deal of my time over the years. Before coming to London I was in charge of an area in South Wales where we had the most difficult problems so far as environment was concerned. Not so much with clean air, of course, because as you know the South Wales coals are largely not smoke-producing; but I was interested in reading the programme for this week to see that the Society are not necessarily sticking to clean air as their prime objective. Having done an awful lot of work on this subject of clean air—and a lot of good results have flown from this—you are now spreading your attention to very many other things. In fact, when one looks at the programme, we in the mining industry and in the oil industry and all the others realise what a marvellous job has been done so that it is now possible to spend time looking at other things instead of spending all your time looking at clean air. We do thank you for the compliment.

Anyway, I must be perfectly serious now and get down to something to which I ought to refer. I know that Mr Ezra would have wished to refer to the possible implication for clean air of the much publicized, so-called energy crisis. I say "so-called" advisedly. Mr Ezra, who has been drawing attention to this for a very long time now and before the facts received wider acceptance, would certainly have wished me to discuss it.

The facts really are fairly simple. The world energy demand is increasing faster than supplies can be made available, while growing extraction problems, let alone political ones, will in all probability make it even harder to expand production. When you think that at the moment requirements are expanding at the rate of about 300,000,000 tons a year of coal equivalent—which is equivalent, by the way, to the whole of Western Europe's coal production—one can see the size of the problem. And if the basic facts are simple, the projection of what can be achieved to meet the increase and in particular the contribution which oil is going to be called upon to make, then we can see that we have a lot to think about. This more recent problem in the Middle East of course accentuates the whole difficulty. Anyway, whatever view one takes of the future position, two facts, I think are bound to emerge. First, if we can avert widespread actual physical difficulties in meeting the demand for power, we must spread increasing cost as a result of the tightness of supply. No matter how socialized we would wish to be or may not wish to be, the old law of supply and demand will always operate; and if oil or coal or any other fuel is in tight supply then we are going to have money squeezed out of us. I don't think anyone would argue with that.

But that in itself must give a further impetus to the whole question of fuel conservation, with which I will hope to deal later. As far as my own industry is concerned, we feel almost indispensable again. I say "almost" because we have had these happy thoughts in past years and within a short while of thinking that we were going to be called upon to play an even greater role, something has happened to knock us back. But we do feel that we have a very important role to play because of one thing we must be sure and that is that all the fossil fuels that are available will need to be exploited as the years go by; and fortunately, of course coal is in greater quantity in the earth, we think, than any of the other fossil fuels. Some bright chap has worked it out that there are  $3\frac{1}{2}$  million million tons.

I very much doubt whether I will be here when the last ton is produced; but it does indicate to you the tremendous quantities available. And if people are right in saying that some of the other fossil fuels are going to become increasingly difficult to get—as indeed will coal—then it is quite obvious that coal must continue to play a very major role in the energy supply pattern

in the future. This is proven, of course, by the fact that everyone of the countries that have massive coal reserves are spending tremendous amounts of money on massively expanding their coal production. Particularly in the U.S.A., in Canada, Australia, South Africa, the Soviet Union and China.

What are the implications of all this to the contribution of coal in the U.K. and on clean air? I don't think we can expect the same sort of massive expansion here as they are planning in the U.S. and in the U.S.S.R. But the new situation means that coal will continue to play a major role in the U.K. market. After all, this is why the Government brought in the Coal Industry Act of 1973; because as a good sensible Government they realised that this industry needed to be supported for a couple of years until we got on to our feet and the country needed us to do that because we have this major role to play.

We are so excited about this future role and the fact that this has been recognised, that we are having a very searching look at what we need to do over the next two decades to make sure that we are not found wanting by the country and that we do make our contribution. Until about 1980 it is fairly obvious we can depend virtually on our existing resources; that is in the way of pits and drifts of entry into the seams. What we need to do, up to 1980, is to continue to improve productivity; to replace muscle as much as possible by electrical horse-power and by machines; take the sweat out of mining. If we don't do it, we wouldn't get the men anyway. We must make the job as easy as possible for people; make it as exciting as possible. We have the capacity and the ground in existing pits. Given this will to mechanise and improve productivity will take us up to 1980 and beyond.

From 1980 to 1990 we will continue to use a major part of this capacity for our production, but there will be a need to get new entries and pits to come into operation about that time. It takes anything from about eight to 10 years from the time you start the hole in the ground until you reach full production, so we would need to start on these new enterprises very quickly indeed. There is plenty of coal in the ground particularly in the Midlands territory, very good coal which is reasonably easy to get at, but we will have our problems.

We have recently floated the idea of a massive new mine at Selby in Yorkshire and already the environmentalists are after our blood—and it has got nothing to do with clean air I promise you. But we feel that with all the things we have tried to do in the industry in the way of protecting the environment, all the work we have done with open cast mining, the restoration of sites, the landscaping of tips and so on, we have built up sufficient experience to enable us, when we sink these new pits, to make them very inoffensive to the eye and inoffensive to society generally.

So up to about 1990 we see the position fairly clearly. I don't think it is very wise to look too far ahead. I think one must always work on a rolling basis otherwise one gets committed to expenditure for something which is out of date by the time you do it. I think they even do that in the oil industry. Anyway, from 1990 onwards, coal will continue to make its contribution. But I believe that by that time the bugs will have been ironed out of the problems that nuclear power has presented, and I think nuclear power by then will be playing a continuing and increasingly important role in electricity generation.

As I said, the industry has this plan first by utilising existing mining capacity and then gradually improving on it. We have, as I said, new reserves around the country in places like Yorkshire. One interesting thing that you might like to hear about is the tremendous reserves of coal we have now proven around the Durham coalfield, out under the sea. Only this week the expenditure of some £5½m has been authorised to get access to mine some high quality coking coal reserves further out under the North Sea around the Durham coalfield.

There is no doubt that we can expect that possible shortages and more immediately rising prices will result in a drive for greater efficiency in the use of all fuels. If one casts one's mind back to the war period when we really started to get down to this whole question of greater fuel efficiency, a great deal of work was done at that time. We achieved performances that had been unthought of in years gone by. I think this urge to improve our efficiency in the use of fuels has continued; but with the obvious tightness of supply and the escalating costs due to all types of inflation, then this becomes even more important. A great deal of money is being spent on this and will continue to be spent, and I feel that this goes hand in hand with the small question of reducing pollution; because the more efficiently we burn these fuels the less pollution we get. Domestic smoke control is still intimately involved with solid fuel. We as much as anyone else in this Society regret the effect which the shortage or, more correctly in most areas, the rumoured shortage of solid smokeless fuel had on the progress of smoke control in 1970 when there was a sharp reduction in new orders. This shortage really at that time stemmed more than anything else from the closure—the rapid closure—of gas works. One doesn't criticise the gas industry for this; they were presented with a new technology—in fact they have had two new technologies given to them in most recent times—and they got on with their job of closing gas works. This was very nice for them but not very good for us. And, of course, it did show a very severe strain on our supplies to compensate for that. In any case, this is an opportunity for me to stress that as a result of the investment made by the industry following those events, there is now ample smokeless fuel available for all types of appliances and we envisage no problems in supply which may result from an accelerating programme of smoke control. This is what we are anxious to do. To indicate that we are able to do our duty and having got smoke control zones set up, we would be able to supply our part for that market. Anyway we are always anxious to get business because we need the cash!

Since that time, however, as well as conventional smokeless fuel burning appliances, we have placed great emphasis on developing the "smoke eater" principle. In other words, using appliances which burn bituminous coals—which are notorious coals for producing smoke—appliances designed to consume the smoke as it is being made, the result being no smoke up the chimney or up the stack. We have had a great deal of success with this and we regard this as one of the means of enabling smoke control to be introduced more rapidly particularly in the traditional mining areas in the Midlands and in Yorkshire where they have these coals. Of course, in South Wales we produce the most marvellous smokeless fuels but Welshmen are notorious for wanting to keep their own unto themselves, so it will help us a great deal when we can get the Yorkshire and Midland coals burnt in these "smoke eaters".

To illustrate my point that conservation can equally reduce pollution, these appliances do burn bituminous coals smokelessly at an efficiency at least 50 per cent higher than the efficiency achieved when such coal is burnt in an open fire; so this comes back again to this question of improved efficiency. Incidentally there are now some 25,000 of these appliances installed and the development work continues to make units better able to cope with the ever increasing and wider range of bituminous coals.

This almost sounds like an advertising campaign, and it is of course! In the industrial markets, similarly, the higher efficiency of modern boiler plants goes hand in hand with lower emissions; in addition, with the fluidised combustion system on which the Board is now engaged—we spent an awful lot of money on this for medium-sized industrial plants as well as power station boilers for which this system has been more fully publicised, it seems likely that for a modest cost, up to 95 per cent of sulphur can be retained in the ash. I think that the most offensive thing that people find in smoke apart from the grit and the visible signs, is this terrible business of sulphur.

Now there is no doubt that the expansion of the mining industry will involve greater effort by the Board to reduce and eliminate other forms of pollution. And when I talk about pollution, I accept the pollution of tips, scars left by open-cast mining and so on. We have done an awful lot of work on this. We were pressed by certain dreadful things that happened some seven or eight years ago; but I am sure that any of you who have had the opportunity of going around the valleys of Wales or in the Midlands or other places will agree that you have seen evidence of a tremendous amount of work on the landscaping of tips, the creation of recreation areas, and the reclamation of derelict land sometimes coincident with the exploitation of open cast reserves. All this is going to continue and we are determined that it will go on as rapidly as possible and that

we will not hold back on this job in any way at all.

In spite of this surge in potential energy business, we still expect to have to compete vigorously for business. I am sure the President will be competing vigorously on his side of the energy table; we will be competing on our side and this is very good for the people who buy it at the end of the day. I am sure that competition between us, sensible competition, competition which enables us to plan wisely the use of our resources is all to the good. Then there is the exciting fact that in a few years we could be a net exporter of energy. This is a very exciting prospect, but in itself it does lay a very onerous task to make sure that we don't exploit our resources in a stupid way, that we conserve them, satisfy the needs of the country, get a bit of the cash for the country out of it, but still do it in such a way that posterity won't curse us for being profligate with our resources.

Well, we carry on spending money to advertise our business and I have had a pretty cheap advertising campaign tonight for which I am very grateful. We are concentrating all our selling and services activities within the new Solid Fuel Advisory Service and there are many people here tonight whom I must thank for the very splendid part that they play in this. A large part of the reserves of money are devoted to canvassing and advising the public in those areas affected by new smoke control orders or which are likely to be affected by such orders in the future.

I think I have said enough: I could go over it all again in summary but the President wouldn't thank me one bit for it. I will say, in closing, how much I have enjoyed coming here tonight. I am sorry you have had to put up with me instead of my Chairman. But there you are, you can't be lucky all the time. I welcome you all and I would now ask of you to give of your best this week. It is my great pleasure to open the 1973 Clean Air Conference and wish you all a very successful and helpful time.

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## Pollution Monitoring

A Pollution Control team at the Corporate Engineering Laboratory in London (Battersea) is to contribute to the British Steel Corporation's programme of work aimed at minimising the effects on the environment of its main production processes. An important area of the work is concerned with the reliable monitoring of pollutant levels.

A vacancy exists for a Project Officer to co-ordinate the monitoring programme and his tasks will include the production of technical evaluations, organising works trials and initiating research work in areas where the Corporation's monitoring needs are not met by existing techniques. The job will necessitate working in close

collaboration with outside research establishments in the UK and the other countries of the European Coal and Steel Community.

The successful candidate will be a graduate and will preferably have knowledge of pollution abatement techniques and experience in the monitoring of air and/or water pollutants. He will be able to show a multi-disciplinary approach to problem solving.

If you feel your abilities and interests meet the above requirements, please write for an application form, quoting reference, from R. R. Coles, British Steel Corporation, Corporate Engineering Laboratory, 140 Battersea Park Road, London SW11 4LZ.

## TORQUAY CONFERENCE

### Presidential Address

by

H.B. Greenborough



Ladies and Gentlemen, although I know that this will be done more formally later, I should like first of all to thank Mr Davies for the stimulating address which he has just given. As I said when introducing him, he is deputising at very short notice for Mr Derek Ezra, and I should like to take the opportunity, on your behalf, of wishing Mr Ezra a full and speedy recovery from his recent illness.

I do not propose to cover in any detail the conference programme, except to say that the wide field covered by the papers to be presented reflects the way in which the Society is broadening its horizons and demonstrates how air pollution must be considered as part of the total environmental problem. I hope that you will find the conference both interesting and enjoyable.

In the first session tomorrow morning Mrs Moss will be dealing in depth with the present position in regard to smoke control, but it is pleasing to report that 1972 was a vintage year for smoke control and this reflects great credit on the efforts of this Society. Our object now should be to see that the momentum is maintained until smoke control has been introduced throughout all the urban areas of the country.

1974 will, of course, see the introduction of a new

local Government structure. These changes will reflect on the Society and its structure and many of you will be aware of the change in the Society's structure which is contemplated to meet this new situation. The local Government changes will, to some degree or other, also affect many of the delegates to this conference and it is particularly pleasing that the CPHI's in their new role as Environmental Health Officers will be accorded the status of Departmental Heads in the new District Authorities. This is a fitting recognition of the importance of their work.

In my speech at the AGM this year I made a brief reference to the future and the future of the world's energy resources and the problems which will need to be tackled if adequate supplies of energy are going to be made available in the future. Since then this subject has received an increasing amount of attention in the media in speeches and in papers given at various conferences. I thought therefore, as I have said earlier that it will be useful if I were to devote the greater part of my address this evening to this subject and particularly to the ways in which various facets of these problems may impinge upon the work of the National Society for Clean Air. Inevitably most of my comments will refer to the situation from an oil point of view, partly because I work in that part of the industry and I feel that I can speak with a small degree of authority, but, of course, not only for that reason, but mainly because most of the attention in this context has been focused on the oil scene at this moment of time. I think again you will see as we move on that this degree of complementarity between what were previously competing fuels in what will emerge, one hopes, as a total energy policy for this country and for Europe will be supported.

Now when I first started to structure this address two weeks ago, of course we were not confronted with a war situation in the Middle East. When I speak in a moment about energy problems rather than energy crisis this has to be seen in the context of a non-war situation. I would be foolish if I attempted to forecast the outcome in oil terms of this terrible upset that plagues the Middle East at this moment of time. The Government, the oil industry, all concerned are monitoring the situation on a day-to-day basis and are prepared to take whatever action that is demanded as events evolve. One is hopeful that we will not be subjected to too great an inconvenience, but nevertheless, as I said earlier, it is almost impossible to read the situation as it emerges day by day. But if one can leave—perhaps it is somewhat academic to speak this way—but if one can leave this war situation to one side for the moment and look at what were the shorter-term implications of energy before this started, I feel that what is necessary is a clear, cool analysis of the situation, the problems and the possibilities with

recommendations for action, where action is called for, and an avoidance of panic measures or even of precipitate action where this is premature. Particularly so far as oil is concerned there has in many of the comments made recently been a degree of confusion between the situation which we are facing now, that is prior to this conflagration, and the long-term problem in relation to the physical availability of crude oil resources throughout the world.

Now the present situation has little or nothing to do with the physical availability of crude oil resources. The known reserves throughout the world at this moment in time are sufficient to carry us through for at least another 20 years. If we are able to find new sources of oil or recover oil from its present reserves in a more efficient way, then we would be able to extend that period. But the short-term energy problem stems essentially from the present tightness in oil supplies both crude and products and I don't apologise for saying once again that this is leaving to one side whatever action may be taken by whatever party as a result of this particular conflagration.

A week or two ago the oil companies were saying to the media that other things being equal, i.e. no unexpected interruption in the supply line nor any undue severity of winter, we would be able as an industry to meet all contractual obligations over the coming months and it is in this context that I talk about the tight supply situation. It has been brought about by a widening gap between the U.S. domestic supply and demand equation resulting from diminishing availability of natural gas. They have reached the peak of their domestic oil production and environmental pressures against the development of new oil, coal or nuclear resources. As a result the U.S.A. has joined western Europe and Japan as a major importer of oil.

Furthermore, several Middle East and African countries now possess the option of regulating their oil production from year to year according to their own internal economic and political objectives, rather than in response to market demand. Certain individual companies have been affected by a shortage of crude oil induced partly by producer-country controls. For the industry the vital shortage has been of refinery capacity, concentrated in the U.S.A. and arising primarily from environmental pressures.

Now the resulting shortages have been relatively small and limited to certain products, but the repercussions have been world-wide. The main impact has been on price levels, not availability of supply. Those mostly affected have been the customers and the suppliers who, during the period of surplus, took advantage of spot purchases at extremely low prices. Now this market no longer exists. Many of those suppliers are finding it difficult to survive in the face of today's prices. The established suppliers have, with very few exceptions, maintained deliveries to their established contracted customers. Again I have to repeat this is, of course, as long as there is no disruption as a result of the present situation.

Now the present problems are, therefore, primarily political and economic. The oil supply/demand balance is very delicate and vulnerable to political action by the oil producers, and will only be observed by appropriate policies and positive action on the part of consumers, the consuming Governments and countries and the producing countries alike. Moreover, with so narrow a balance, fluctuations between sufficiency and shortage could be-

come a characteristic of the energy scene. Finally, it is quite apparent that an energy problem such as that of the United States cannot be limited in its effects to one country only. An energy shortage in one key area today is likely to have world-wide repercussion and affect virtually every country.

Now I would like to turn to the longer-term energy picture about which a great deal has been written and said. A number of forecasts have been made as to when the world will run out of oil. Mr Davies says the world has a greater chance of running out of coal at a later date than oil by quite a number of years. But many of these forecasts, the oil forecasts, are in conflict with each other and I would not wish to add to the confusion in your minds by producing a forecast of my own. I have indicated that oil with present known reserves and against background of increasing consumption would certainly last for another 20 years or so, but by the 1980s or 1990s, production of conventional crude oil will reach its peak and thereafter begin a slow decline. I should point out that when this peak is reached we shall be producing about twice as much crude oil as we are now. This decline could, of course, be offset by the discovery of new oil provinces in new parts of the world. I think you would all agree that North Sea oil is still a recent development. In 1965 the drill started going down and it wasn't until very recently that we were able to talk about the type of discoveries that give us great comfort for our security for the long-term to come. We are now able to drill in the Shetlands in 500-600 feet of water, in hostile areas with wind gusts of 100 miles an hour. We are planning to drill in 3,000 feet of water from floating rigs; and once that has been achieved we can possibly go down indefinitely to 5,000-6000 feet of water which will give us entirely new horizons in terms of our future activities. So one is giving, in my view, a relatively pessimistic view if we were to assure that no major oil provinces will be found over the next 20 years. The problem facing the world, therefore, is to exercise sufficient foresight to ensure that other forms of energy are available to meet the world's need in sufficient time to compensate for the decline in oil production. After all we have not found these new oil provinces yet, and if they are not to be found then this previous sentence is of very great import. Initially, these alternative sources will be further developments in the coal field of which Mr Davies has spoken; they will certainly be very significant developments in the field of nuclear power, and very possibly significant developments in the fields of what we would call in the industry unconventional oils, the liquid hydrocarbons that are found in the forms of tarsands and oil shales particularly in Canada and in the U.S.A. There is, according to the experts, in Canada alone more crude oil in a different form to be found there as proven reserves than there is in the whole of the Middle East. But unfortunately it is not for us at this moment in time. It will take a lot of research and development, an enormous amount of time and masses of money. But nevertheless, looking down a very long road, one can feel that in addition to unconventional forms of oil that are to be had from coal then the contribution from these tarsands and these oil shales could be truly significant. But it is all quite a long way away.

Now looking towards the end of the century and beyond, there is the prospect of nuclear fusion as opposed to fission, solar energy, geothermal energy and other processes which are at this moment just a gleam in the scientist's eye.

All in all, therefore, ladies and gentlemen, I do not take the view that the future energy situation of the world is such as to justify putting an end now to economic and social growth and progress. Many problems lie ahead which will tax the ingenuity and foresight both of governments and industry if they are to be resolved, but the majority of the world's population, especially within the developing world still has ambitions for much higher standards of living and a right to them. This calls for a dynamic solution of our problems in my opinion, not a static acceptance of the inevitability of stagnation.

What then are the implications for us all in the future? First, it must be accepted that while oil will remain for many years a dominant energy source worldwide, it can no longer be expected to be the balancing factor as in the past with upward flexibility to meet unpredicted surges of demand or the unplanned short-fall of other fuels. We are moving into an era in which we shall need the development of all economic energy resources and increasingly the different forms of energy will come to be seen as complementary to each other rather than in competition.

In this situation it becomes increasingly important, in my opinion, that Governments should formulate national energy policies. In the United Kingdom, the Society, has, I know, been pressing for such a policy for many years. But now we shall have to become used to a steady increase in the cost of energy supplies, although, as Mr Davies indicated in terms of coal availability in this country, and as I have indicated in terms of oil availability in the North Sea, this country by 1985 will find itself in an extremely privileged position because if you add his coal to the nuclear programme as it now stands—and one hopes there will be a great degree of enhancement given to the speed of this programme. So coal, nuclear, natural gas and oil from the North Sea at present perhaps conservatively estimated as it is as between seven and one hundred million tons of oil in 1985, this means that this island by that time will be something like 85 per cent sufficient in indigenous energy resources of all kinds. This is quite a remarkable position to look forward to in terms of security of supply. It has a natural bonus and, in terms of the balance of payments, an enormous contribution to make.

But the costs will rise. For the past 50 years the basic cost of energy has scarcely changed in money terms. In fact, in real terms I think it has declined. The cost of oil supplies is inevitably going up, not only because of the action of the oil producing and exporting countries but as a result of the increasing costs of providing and proving and developing new oil provinces to which I have just referred. So the consumer who was for years become used to energy as a low cost commodity, freely available to him, will certainly have to change his attitude, although perhaps only slowly. I think the other forms of energy will doubtless be confronted with cost increases as they take the burden of the rise of inflation.

Now, the increasing cost of energy will, however, give impetus to improve the conservation of energy which is, in itself, a most desirable objective. This involves not only making a rational use of our resources so that particular fuels are employed for those purposes where they can be most efficiently used, it also involves the maximum efficiency in their use and the reduction of waste to a minimum. A sustained concentration on energy conservation could make a significant contribution to the solution of the problems with which we are now faced. This is particularly so in the case of the U.S.A.

with its vast use of energy and its profligate waste of it. It has been calculated that enormous savings in petrol could be achieved if the average size of the American car engine were reduced to that of the European motor car. It is of interest that the current shortage in the U.S.A. has already increased the demands for small cars. It was also reported recently that if the American householder was prepared to lower the temperature of his home by only two degrees from the current figure of 75°F this could save 50,000 barrels of oil per day—and that is one-quarter of a major oil field which, if found in the North Sea, would cost £200,000,000 to develop.

But in this country, too, there is much we can do to reduce our wasteful usage of energy. One has only to mention in this connection the general low standard of house insulation. To the extent that energy conservation and the measures associated with it on the one hand improve the efficiency of combustion and on the other reduce the consumption of energy, their effects, I would submit, would be very much in line with the objectives of the Society.

Now I should mention here that most of the future projections in relation to energy consumption have been based on extrapolation of existing trends, and leaving aside the effect of a less wasteful use of energy resulting from its increasing costs, I wonder whether such extrapolations are altogether realistic. I wonder. Such long-term projections would, for example, indicate that energy consumption in this country will quadruple over the next quarter of a century. But will this really be the case? It could well be that economic, social and environmental factors will bring about certain constraints on demand and that these constraints will set the pattern rather than any physical shortage of fuel.

I mentioned earlier that, to some extent, environmental pressures in the U.S.A. which constrained the building of new refineries were responsible for the present shortage of refining capacity in that country. This is but one example of the possible conflicts that may exist between environmentalists and those responsible for providing energy. There will inevitably be many others. How best, for example, can we in the long term reconcile the objective of a satisfactory control of ambient air in cities and conurbations with the need to make the best use of our limited energy resources? Such questions while by no means insoluble, will require a sensitive and balanced approach by all those concerned including members of this Society.

Now ladies and gentlemen it is a measure of the dedication to its task that this Society opens its conference with an after-dinner session, and therefore I do not wish to take more of your time on an evening when social interchange among delegates is obviously a highlight of the proceedings. I have not, therefore, been able to do more than skim the surface of what is a vast and very complex subject. I hope, however, that I have been able to give you a general view of the situation as I see it, and some indication of the areas in which problems are likely to arise in the future. Satisfactory solutions to these problems can, I am convinced, be found, and I am equally convinced that these solutions will be consistent with the environmental improvements which we all desire. In arriving at these solutions, governments, producers of energy, consumers of energy and those such as the members of this Society, who are concerned with the environment, will all have their part to play.

# EFFLUENT OF PAINT FUMES BY INCINERATION A CASE HISTORY

by

W F Dabbs, B.Sc A.I.M.

R P Warner, B.Sc.

## Introduction

In the mind of the general public, pollution and the car industry are linked in the form of car exhaust fumes. However, other aspects of pollution frequently demand the industry's attention. These arise from the large and complex production processes used to manufacture motor cars. For example, careful control must be kept over liquid effluents from those factories which use vast quantities of rinse water for the cleaning and painting of car bodies. Similarly the painting process involves several stoving ovens, in which fumes are evolved which can create problems if vented to atmosphere in residential areas.

At Longbridge, British Leyland has recently installed a completely new painting plant with integral effluent control (both liquid and gaseous)—the first in the country.

At the Corporation Assembly Plant, Cowley, effluent treatment has recently been installed on existing paint ovens by modifying and incorporating additional equipment. It is the installation of this plant and the steps in its choice that this article reviews.

## Background

As the painting of cars becomes more sophisticated by the development of new paints and painting methods, existing plants are frequently modified and uprated. In such cases plants which have been environmentally acceptable for many years may suddenly become unacceptable. It is regrettable that despite intensive laboratory studies of new materials it is often difficult to predict the side effects of a change of process or material on the environment. In such cases it is necessary to install corrective measures after introduction, and the realisation that problems have been encountered. This is an unsatisfactory procedure, and one which is changing as the techniques for predicting the effect of new materials and processes are being developed.

At Cowley an old paint plant was extensively altered in 1969/1970. This plant is sited near to a residual area as shown in figure 1. The alterations included the installation of two electropaint primer tanks to precede the epoxy sealer paints. The topcoat facility and materials remained the same. Figure 2 is a block diagram showing the various stages in the paint process. It was soon evident that a fume problem in the form of an unpleasant odour—reminiscent of fried food—was being caused by the new materials. Under certain weather conditions this was unacceptably strong and on occasions a white fume (from the stacks) was evident at ground level.

## Analysis of Effluent

Immediately this problem was apparent an intensive investigation into the exact cause and nature of the smell was commenced. This meant that when, following discussions with the Local Authority, a decision was taken to install treatment plant, it could be acted on as rapidly as possible with the knowledge that the treatment selected would be the most appropriate to the actual problem.

Before considering the effluent itself, it is perhaps important to emphasise that it is the high temperature curing of the paint film which generates the smell in the form of degradation products. The offensive smell in this case does not arise from the solvents or thinners used to spray the paints, in fact, one of the coats is water based electropaint which is applied by dipping rather than spraying. The thinners used for the spray coats are mainly volatilised in the flash off area before entering the paint oven. These solvents are very rapidly dispersed in the atmosphere and only present problems under unique conditions such as those occurring in Los Angeles.

It is a well known fact that when a thermosetting paint film is stoved at an elevated temperature a certain amount of degradation will take place. By curing test panels in a specially designed oven, with condensers cooling the effluent to  $-70^{\circ}\text{C}$ , it was possible to collect the degradation products as liquids. These liquids were analysed by both British Leyland and the Physico-Chemical Measurement Unit at AERE Harwell. Infra Red analysis and gas chromatography were used to show that the effluent consisted of at least 34 separate constituents. It was soon evident that a complete identification of all these would be a difficult task, comparable to the analysis of cigarette smoke. However, it was possible to identify aldehydes and ketones (which are known for their obnoxious smell at low concentrations) as the principle offensive constituents. In addition organic acids, and to a lesser extent alcohols and esters were identified. These compounds had molecular weights covering a wide range giving both gases and liquids as products. These general conclusions were found to apply to paints from all the manufacturers and were broadly confirmed by experimental work carried out by them. It was established that, for the materials in use in this plant, no inorganic particulate matter was evolved on stoving, nor were any sulphur or chlorine compounds present in the effluent.

## Treatment Methods

With this information various available methods of treatment were considered. The requirement was for a process capable of handling the high air flow rates employed (typically 12,000 scfm in each of the electropaint



FIG.1 LOCATION OF PAINT SHOP.

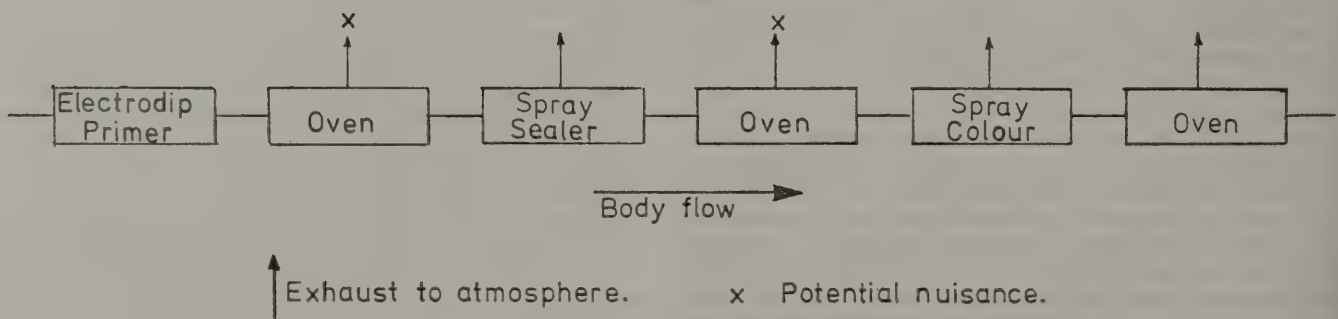


FIG.2 STAGES IN PAINTING PROCESS.

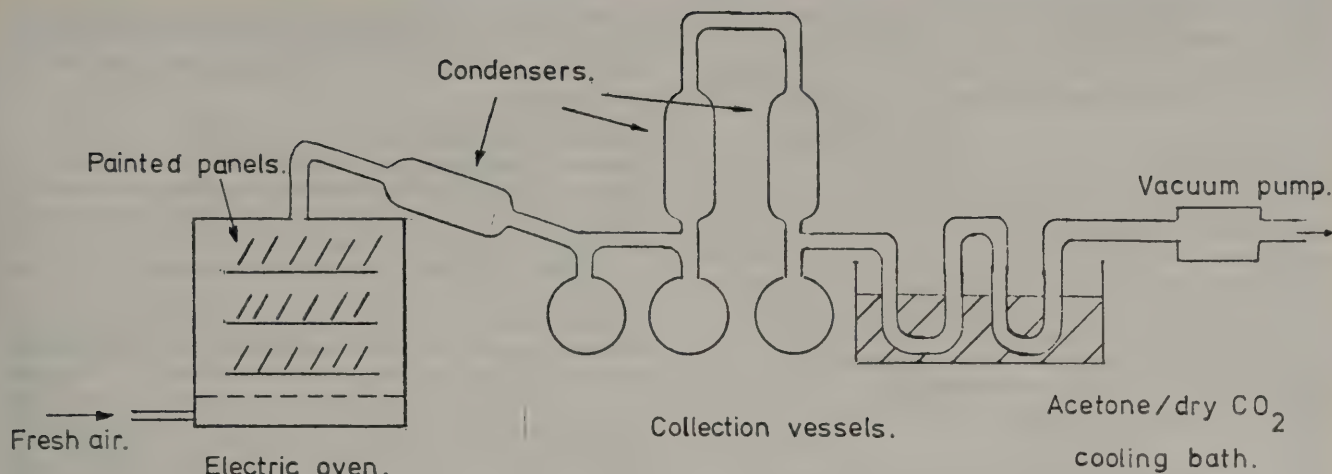


FIG.3 EFFLUENT COLLECTION SYSTEM

ovens), and which would definitely remove the smell adjacent to the plant. A wide range of processes have been advocated for control of smell of this type, they are considered individually below.

#### Carbon Absorption

This technique uses twin chambers containing activated charcoal. Effluent is passed through one chamber in which the charcoal absorbs the contaminant, meanwhile the other chamber is purged by steam which gives a water/effluent mixture. The process is cyclic, one chamber being purged while the other is being used. The system is ideal for solvent recovery, but was not capable of handling the range of materials, including insoluble resinous fractions, without becoming 'gummed up' over a relatively short period of time.

#### Odour Masking

This technique, which superimposes a more acceptable smell on top of the existing offensive smell, was rejected as being unsuitable in terms of the quantity of effluent involved. In addition it was felt that to try and solve the problem by anything less than removal of the effluent would be unsatisfactory and unacceptable.

#### Scrubbing

This was advocated by several equipment manufacturers, none of whom were prepared to guarantee performance. This technique is ideal for water soluble gases or particulate material but is unsuitable for most organic gaseous effluent. It also has the disadvantage, in common with several other techniques, of creating a secondary effluent problem of contaminated water.

#### Condensation

This technique is useful when dealing with a contaminant in vapour form which can be removed by cooling. In our case it was considered unsuitable as some odour remained in the effluent stream even after cooling to sub-zero temperatures. It would be impossible to guarantee the performance of this type of unit with compounds having extremely low threshold 'smell' levels.

#### Incineration

The remaining technique was incineration and this was considered to be the only suitable process. It treats the effluent by burning, which decomposes the offensive materials to carbon dioxide and water. Performance is assured and no disposal problems are encountered. The process has been used widely in the USA with success.

There are two alternative incineration techniques, high temperature or catalytic. High temperature incineration was chosen because of the risk of catalyst poisoning and the cost of its replacement. The use of well designed heat recovery systems can reduce running costs of high temperature incineration considerably. This then permits economical running to be achieved without the complications of catalysts.

#### Plant Considerations

In the Cowley Plant two similar production lines run side by side. The main sources of effluent were the two ovens curing the electropaint primer; on these, incinerators have now been installed.

The detailed design of the two ovens was different, so a common approach was not possible. Each oven treated was handled by a different contractor. Details of the approach used by each is discussed below. (5.1 and 5.2)

##### Line No. 1

The oven on this line was originally fired by several gas fired burners each heating a zone of the oven. The oven temperature required was 165°C and the total volume of air exhausted was 12,000 scfm.

The installation of the incineration was achieved by the complete replacement of the original burners with a single large incinerator. As well as providing effluent control, this incinerator provides all the heat necessary for the oven. The air flow is shown diagrammatically in Figure 4. Effluent laden air from the oven is preheated in the heat exchanger before being blown across the incinerator. The incinerated airstream then heats the incoming air and is cooled slightly.

This hot incinerated air is then used to heat the oven after being cooled by the addition of fresh air. This cooling takes place in specially designed mixing chambers, one for each oven zone, controlled by the heat

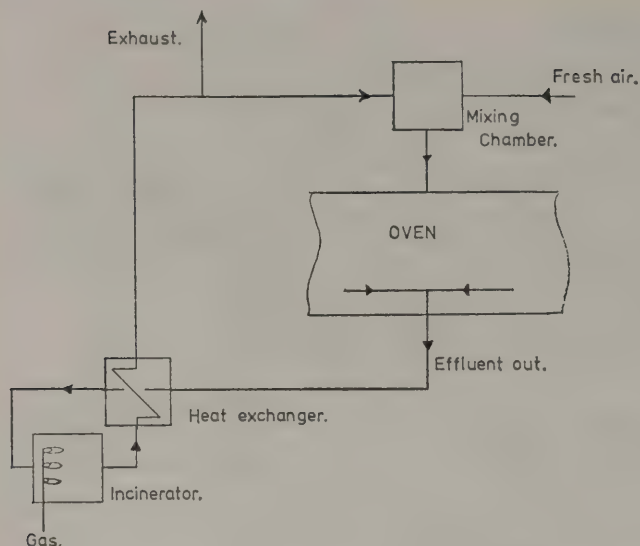


FIG.4 INCINERATOR SYSTEM ON LINE NO 1.

demand from the oven. This is the sole control point, the incinerator itself does not modulate according to the heat demand. A small quantity of air is bled off to atmosphere in order to balance the system.

#### Line No. 2

The installation on this oven was approached differently as Figure 5 shows.

The oven was originally fitted with four indirect fired burners each heating a zone of the oven. The installation of incineration was accomplished by the addition of two incinerator units each treating half of the oven. The effluent laden air is sucked from one half of the oven and preheated before being passed through the

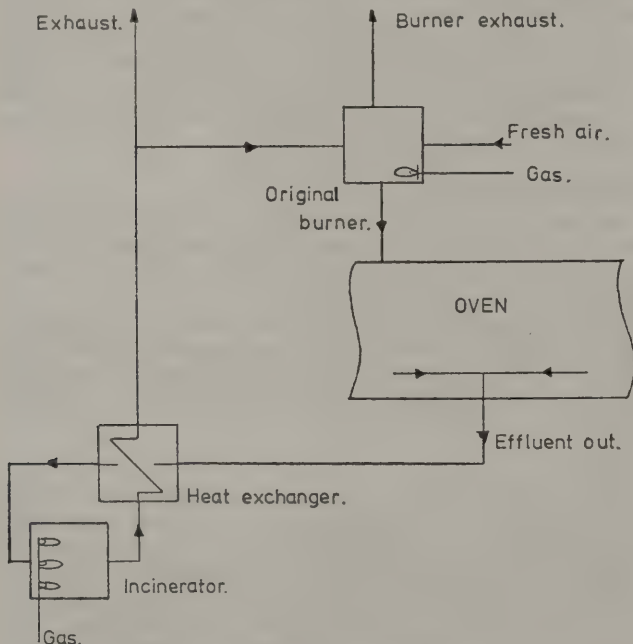


FIG.5 INCINERATOR ON LINE NO 2.

incinerator. The resulting hot air is used to preheat the effluent and is then ducted partly to the original burners and partly to exhaust. The burners adjust the temperature as necessary to heat the oven. Once again the incinerator does not modulate according to the oven heat demand. Control is achieved by the original heaters alone.

#### Time Scale

It is worth mentioning that once a decision had been taken to install treatment plant, only seven months

elapsed before the plant was installed and running. With hindsight this was insufficient lead time to completely check out the system and has resulted in many subsequent plant failures.

#### Incinerator Performance

Before commenting on the performance of these incinerators the design requirements should be considered. These were that there should be no odour nuisance to the locality, and that the incinerators should operate at an efficiency of conversion of hydrocarbons of 90 per cent or better.

A consideration of the reduction of odour is difficult as the response of the nose is not quantitative and varies considerably from person to person. However, there is no visible effluent plume from the exhaust stacks and an analysis of the effluent stream shows a hydrocarbon concentration ranging from 0-10 ppm referred to methane. 90 per cent efficiency can be achieved across the incinerator even when any increase in CO is taken into account. Hydrocarbon levels were monitored using a flame ionisation detector.

It is common for teething troubles to be experienced when a new plant is installed and this has been the case with these incinerators.

The difficulties experienced have arisen from the fact that the equipment is operating continuously under relatively aggressive conditions. At start up the temperature of the equipment is raised from ambient to 750°C and this causes expansion, creep and fatigue problems which are more extensive than normally encountered in a paint shop.

Fans which are used to circulate the air have failed as a result of fatigue and shock loading with hot and cold airstreams. In addition differential expansion between the incinerator lining and its supporting frame has caused one of the linings to distort extensively.

There is confidence that these problems will be resolved as experience is gained in new materials, but inevitably these difficulties mean that optimum performance is not always obtained.

#### Other Installations

To complete the picture it is necessary to mention two other plants at which incineration equipment is operating.

At the British Leyland Radiators Division Plant in Oxford a small in-line burner is used to control the effluent from a small parts oven. In this case the installation is so small that the capital cost of heat recovery was not justified. It, like all our incinerators, is natural gas fired, but it should be noted that this is not the only suitable fuel, it is quite possible to fire with oil. At the Longbridge Plant units similar to those in operation at Cowley have been installed. These were designed as part of a completely new painting facility and incorporate sophisticated heat recovery. For example heat from the sealer oven incinerators is recycled and used both in the sealer and the colour ovens.

#### Conclusions

The effectiveness of incineration for fume and odour control has now been proven by the operation of several units within British Leyland.

However, the existence of problems in terms of the ability of the incinerators to operate without failure over long periods must be acknowledged.

A significant improvement in the quality of the environment around these factories has resulted with benefits both to the Company and the local residents.

Looking to the future it is certain that improvements in techniques other than incineration, as well as the introduction of new materials, will result in even more effective means of controlling pollution.

## Bright Satanic Mills

by Roger Meetham

When I made my pilgrimage to Trail, British Columbia, I half expected to find a dark dramatic place, straight out of Blake or Dante. Instead it was a colourful town of single storey houses, wood-built but durable, bathed in the sort of hot-weak sunshine, one might get in San Francisco or Los Angeles. The streets are not in the dreary grid pattern, but hug the hillsides. In the town centre the street signs seem less brash and gaudy than in most American and Canadian places. Trail is comfortable, well established and has no need to assert itself.

After all, it was long ago in the early 1930s when the Trail smelter was forced by law either to clean itself up or go elsewhere. American farmers across the border six miles away were suffering damage to crops. The company did much better than the law required. It monitored atmospheric sulphur dioxide, and kept below a maximum well underneath the legal requirements. It restored the plant life by getting grass to grow and planting over a million trees and shrubs—using its own fertilizers including ammonium sulphate, a by-product of sulphur dioxide recovery. It converted coal-fired boilers to gas, and removed flue particles from the lead smelter blast furnaces in a “baghouse installation”

which cost a million dollars. Today it takes and returns 50 million gallons a day from the Columbia River, and “rainbow trout are caught regularly from the river a few hundred feet downstream from the outflows”.

With a banker from Trail and a school teacher from Vancouver and their wives, I made a tour of the works and saw the processes of making pure zinc, lead, silver and gold. The crude zinc production and much of the refining is done in vast electrolytic plants, but the most spectacular item is the removal of huge quantities of red-hot slag from the lead smelter. In the afternoon my family took me to a charming park on the bank of the river opposite the works, and my grandchildren paddled as enthusiastically as if they had been at Bridlington. Sheffielders please try to do something similar on the Don.

My pilgrimage ended with a return 50 miles up the Columbia River to the brilliant hot evening sunshine of Kootenay Lake. I must now spoil a story of perfection by recalling that, on our way to Trail that morning, we were aware of the smelter works long before the two great smoke stacks came in sight, 10 miles away and round a bend in the river. In fairness, the plant had been shut down for a two-week holiday and the smog we saw was transient. I shall probably never find out what Trail looks like in normal times—unless I retire there as many of the smelter workpeople do.

The National Society for Clean Air has pleasure in announcing the following Conference venues and dates:

### 41st Clean Air Conference

**CARDIFF 14th—18th October, 1974**

### 42nd Clean Air Conference

**BRIGHTON 20th—24th October, 1975**

### 43rd Clean Air Conference

**EDINBURGH 11th—15th October, 1976**

### 44th Clean Air Conference

**HARROGATE 10th—14th October, 1977**

# SMOKE CONTROL AREAS

## Progress Report

Position at 30th September 1973

(Figures supplied by the Department of the Environment, The Welsh Office, The Northern Ireland Ministry of Development and the Scottish Development Department.

	England			Wales			Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 30.6.73</b>	4,128	1,252,925	5,832,786	14	1,961	7,102	214	199,504	509,192	55	13,987	32,956
Acres .. .. .												
Premises .. .. .												
<b>Smoke Control Orders Confirmed (30.6.73-30.9.73)</b>	73	30,602	95,331	—	—	—	8	2,912	8,504	1	—	—
Acres .. .. .												
Premises .. .. .												
<b>Totals .. .. .</b>	<b>4,201</b>	<b>1,283,527</b>	<b>5,928,117</b>	<b>14</b>	<b>1,961</b>	<b>7,102</b>	<b>222</b>	<b>202,416</b>	<b>517,696</b>	<b>56</b>	<b>13,987</b>	<b>32,956</b>
<b>Smoke Control Orders Submitted (30.6.73-30.9.73)</b>	73	19,745	91,008	—	—	—	1	483	2,352	1	80	1,025
Acres .. .. .												
Premises .. .. .												
<b>Grand Totals .. .. .</b>	<b>4,274</b>	<b>1,303,272</b>	<b>6,019,125</b>	<b>14</b>	<b>1,961</b>	<b>7,102</b>	<b>223</b>	<b>202,899</b>	<b>520,048</b>	<b>57</b>	<b>14,067</b>	<b>33,981</b>
<b>Smokeless Zones (Local Acts) in operation.. ..</b>	44	3,400	41,060	—	—	—	—	—	—	—	—	—
Acres .. .. .												
Premises .. .. .												

## SMOKE CONTROL POSITION IN REGIONS OF ENGLAND

at 30th September 1973

(Figures supplied by the Department of the Environment)

(1) Region	(2) No. of black area acres covered by smoke control and smokeless zones orders confirmed or awaiting decision	(3) Percentage* of total black area acreage in region covered	(4) No. of black area premises covered by smoke control and smokeless zones orders confirmed or awaiting decision	(5) Percentage* of total black area premises in the region
Northern .. .. .	64,209	51.2	272,512	49.3
Yorks & Humberside .. .. .	263,298	69.9	828,431	70.9
East Midlands .. .. .	87,066	32.4	263,747	51.5
Greater London .. .. .	296,082	90.5	2,454,101	93.0
North West .. .. .	247,352	60.3	1,046,649	61.5
West Midlands .. .. .	107,641	43.2	492,987	46.9
South West .. .. .	11,231	42.6	41,278	27.7
Total (black areas) .. .. .	1,076,879	60.7	5,399,705	69.4
Outside black areas .. .. .	226,393		619,420	
<b>Grand Totals .. .. .</b>	<b>1,303,272</b>		<b>6,019,125</b>	

\* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (eg: there may be some areas of open country).

## New Smoke Control Orders

*The lists below are supplementary to the information in the last issue of Clean Air (Autumn 1973) which gave the position up to 30 June 1973. They now show changes and additions up to 30 September 1973.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.*

*\* Information supplied on a Reconciliation List by the Department of the Environment.*

### ENGLAND

#### NEW SMOKE CONTROL ORDERS IN OPERATION

##### Northern

Boldon U.D. (No. 20), Hartlepool C.B. (No. 22), Newburn U.D. (No. 14), Sunderland C.B. (No. 9), Teesside C.B. (No. 9B and "C"), Tyne-mouth C.B. (Nos. 13 and 14), Wallsend B.C. (No. 6), Whickham U.D. (No. 11).

##### North West

Accrington B.C. (No. 12), Altrincham B.C. (No. 11), Ashton-under-Lyne B.C. (Nos. 14 and 15), Ather-ton U.D. (No. 7), Bebington B.C. (Nos. 15 and 26(1)), Birkenhead C.B. (Nos. 17 and 19), Blackburn C.B. (No. 12), Blackrod U.D. (No. 4), Brierfield U.D. (No. 6), Bredbury & Romiley U.D. (No. 4), Crompton U.D. (No. 6), Darwen B.C. (Nos. 10 and 11), Droylesden U.D. (No. 15), Dudley C.B. (No. 58), Eccles B.C. (No. 15), Farnworth B.C. (No. 6), Fulwood U.D. (No. 3), Golborne U.D. (No. 3), Great Harwood U.D. (No. 4), Horwich U.D. (No. 4), Hyde B. (No. 8), Leigh B.C. (No. 13), Manchester C.B. (Alexandra Road and Charlestown), Middleton B.C. (Nos. 18 and 19), Oswaldtwistle U.D. (No. 4), Nelson B. (No. 7), Rochdale U.D. (Mayfield and Halifax Road), Runcorn U.D. (No. 8), Swinton and Pendlebury B. (No. 7), Tottington U.D. (No. 4), Warrington C.B. (No. 17), Widnes B.C. (No. 10), Wigan C.B. (No. 9).

##### Yorkshire and Humberside

Barnsley C.B. (Nos. 16 and 17), Bingley U.D. (No. 17), Bradford C.B. (Bradford Moor), Brighouse B.C. (No. 17), Darton U.D. (No. 23), Dearne U.D. (No. 8), Elland U.D. (No. 3), Halifax C.B. (Nos. 17C and 18A), Heckmondwike U.D. (No. 9), Horsforth U.D. (No. 32), Hoyland Nether U.D. (No. 2), Huddersfield C.B. (Fartown-Fixby), Kingston upon Hull C.B. (No. 12), Leeds C.B. (Nos. 104 and 105), Morley B.C. (Nos. 43 and 44), Rotherham C.B. (Doncaster Road No. 1 and Greasbrough No. 3 and Blackburn), Royston U.D. (No. 1), Spenborough B.C. (No. 13), Stanley U.D. (South Stanley No. 3), Wakefield B.C. (Flanshaw No. 2).

##### East Midlands

Alfreton U.D. (No. 8), Dronfield U.D. (No. 7), Mansfield B. (No. 6), Nottingham C.B. (No. 6A).

##### West Midlands

Aldridge-Brownhills U.D. (Nos. 34 and 35), Coventry C.B. (No. 16), Halesowen B.C. (No. 35), Stoke-on-Trent C.B. (No. 26), Stourbridge B.C. (No. 31), Sutton Coldfield B.C. (No. 25), Walsall C.B. (Nos. 14 and 15), Warley B.C. (No. 10), Wolverhampton C.B. (No. 16).

##### Greater London

Barnet L.B. (No. 14), Brent L.B. (Nos. 12 and 13), Croydon L.B. (No. 14), Enfield L.B. (No. 18), Harrow L.B. (No. 26), Havering L.B. (No. 6), Hillingdon L.B. (Nos. 18 and 19), Lambeth L.B. (Nos. 26 and 27), Merton L.B. (Nos. 23, 24 and 25), Waltham Forest L.B. (No. 17).

##### Outside the Black Areas

Aylesbury B.C. (No. 2), Bedford B.C. (No. 7), Bentley-with-Arksey U.D. (Nos. 1, 2 and 3), Burton upon Trent C.B. (No. 3), Chesterfield B.C. (No. 6), Colne Valley U.D. (No. 1), Consett U.D. (No. 1), Darlington R.D. (Newton Aycliffe No. 6), Dartford B.C. (No. 12), East-Lampstead R.D. (Bracknell Nos. 2 and 3), Exeter C.B. (Pennsylvania (No. 1)), Hebden Royd U.D. (Fairfield Ward) (Part), Hemel Hempstead B.C. (Adeyfield No. 2 and Town Centre), Lees U.D. (No. 1), Letchworth U.D. (Part of Wilbury Area), Lincoln C.B. (Nos. 5 and 6), Market Drayton U.D. (No. 2), New Windsor R.B. (No. 2), Ramsbottom U.D. (No. 6), Rawtenstall B.C.

(No. 6), Reading C.B. (No. 18), Rugby B.C. (No. 15), Runcorn R.D. (No. 6), Skipton U.D. (No. 8), Stanley U.D. (No. 5), Swadlincote U.D. (No. 3), Tamworth B. (No. 6), Thurrock U.D. (No. 9), Waltham Holy Cross U.D. (Nos. 5 and 6), Warrington R.D. (Nos. 7 and 8), Whitley Bay B.C. (No. 9), Workington B.C. (Clay St. No. 1).

#### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

##### Northern

Gosforth U.D. (Nos. 5 and 6), Hartlepool C.B. (No. 25), Hebburn U.D. (No. 15), Jarrow B.C. (Nos. 11 and 12), Newburn U.D. (No. 20), Newcastle upon Tyne C.B. (Nos. 16 and 17), Sunderland C.B. (No. 12), Teesside C.B. ("H" and No. 16), Whickham U.D. (Nos. 14 and 15).

##### Yorkshire and Humberside

Darton U.D. (Nos. 27 and 28), Dewsbury C.B. (North Eastern), Doncaster C.B. (No. 14), Heckmondwike U.D. (No. 10), Huddersfield C.B. (Fartown-Bracknell), Leeds C.B. (Nos. 113, 114 and 115), Swinton U.D. (No. 15), Wakefield C.B. (Park No. 1), Worsbrough U.D. (No. 1).

##### North West

Ashton-under-Lyne B.C. (No. 16), Barrowford U.D. (No. 6), Birkenhead C.B. (No. 27), Bootle C.B. (No. 13), Bolton C.B. (Astley Bridge, Halliwell & West Wards), Darwen B.C. (No. 13), Great Harwood U.D. (No. 5), Huyton-with-Roby U.D. (No. 9), Leigh B.C. (Nos. 14 and 15), Middleton B.C. (No. 21), Oldham C.B. (No. 20), Prestwich B.C. (No. 12), Radcliffe B.C. (No. 8), Rochdale C.B. (Townhead and Whitworth Road), Widnes B.C. (No. 11).

##### East Midlands

Alfreton U.D. (No. 9), Hucknall U.D. (No. 5).

##### West Midlands

Aldridge/Brownhills U.D. (No. 36), Stourbridge B.C. (No. 33), Sutton Coldfield B.C. (No. 28), Walsall C.B. (No. 17), Wolverhampton C.B. (No. 18).

**Greater London**

Bromley L.B. (No. 21), Harrow L.B. (No. 28), Southwark L.B. (Nos. 29 and 30).

**Outside the Black Areas**

Blackwell R.D. (No. 2), Burnley R.D. (No. 2), Hale U.D. (No. 5), Hazel Grove & Bramhall U.D. (No. 10), Lancaster C.B. (No. 7), New Windsor R.B. (No. 3), Rawtenstall B.C. (No. 7), Saltburn and Marske-by-the-Sea U.D. (No. 4), Scunthorpe B.C. (No. 10), Waltham Holy Cross U.D. (No. 7), Warrington R.D. (No. 10), Whiston R.D. (Halewood No. 2).

**\* SMOKE CONTROL ORDERS IN OPERATION PRIOR TO SEPTEMBER 1973 BUT NOT RECORDED**

**Yorkshire and Humberside**

Conisbrough U.D. (Nos. 2, 3 and 4).

**East Midlands**

Alfreton U.D. (No. 7).

**West Midlands**

Sutton Coldfield B.C. (No. 24).

**North West**

Birkenhead C.B. (No. 15).

**\* SMOKE CONTROL ORDERS CONFIRMED PRIOR TO SEPTEMBER 1973 BUT NOT RECORDED**

**Yorkshire and Humberside**

Barnsley C.B. (No. 15).

**North West**

Birkenhead C.B. (No. 18).

**NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED**

**Northern**

Blaydon U.D. (No. 6), Gateshead C.B. (Nos. 16 and 17), Gosforth U.D. (No. 6), Hartlepool C.B. (No. 25), Jarrow B.C. (Nos. 13 and 14), South Shields C.B. (No. 19), Teesside C.B. (No. 17).

**Yorkshire and Humberside**

Batley B.C. (No. 9), Dearne U.D. (Nos. 9 and 10), Doncaster C.B. (No. 14), Halifax C.B. (No. 20), Royston U.D. (Yorks W.R.) (No. 3), Swinton U.D. (No. 16).

**North West**

Bebington B.C. (No. 17), Dukinfield B.C. (Nos. 17 and 18), Eccles B.C. (No. 19), Fulwood U.D. (No. 5), Middleton B.C. (No. 21), Radcliffe B.C. (No. 8), St. Helens C.B. (No. 9), Stockport C.B. (Heaton Mersey/Heaton Moor), Westthroughton U.D. (No. 9), Widnes B.C. (Nos. 11, 12 and 13), Wigan C.B. (No. 12), Worsley U.D. (No. 14).

**East Midlands**

Alfreton U.D. (No. 9), Chesterfield B.C. (No. 8), Hucknall U.D. (No. 5), West Bridgford U.D. (No. 3).

**West Midlands**

Coventry C.B. (No. 17), Solihull B.C. (No. 18), Stoke-on-Trent C.B. (No. 28), Stourbridge B.C. (Nos. 32 and 33), Sutton Coldfield B.C. (Nos. 29 and 31), Warley C.B. (No. 11), Wolverhampton C.B. (No. 19).

**Greater London**

Harrow L.B. (No. 28), Hillingdon L.B. (Nos. 23 and 24), Merton L.B. (No. 27), Waltham Forest L.B. (Nos. 19 and 20).

**Outside the Black Areas**

Bedford B.C. (No. 8), Burton upon Trent C.B. (No. 4), Crewe B.C. (No. 6), Harrogate B.C. (No. 4), Hebden Royd U.D. (No. 2), Lancaster B.C. (No. 8 and Joint S.C.O.), Lincoln C.B. (No. 7), Watford B.C. (Nos. 10 and 11), Wilmslow U.D. (No. 13), York C.B. (No. 4).

**\* SMOKE CONTROL ORDERS SUBMITTED PRIOR TO SEPTEMBER 1973 BUT NOT RECORDED**

**Yorkshire and Humberside**

Rotherham C.B. (Blackburn) .

**North West**

Blackburn C.B. (No. 13), Irlan U.D. (No. 6), Little Lever U.D. (No. 2).

**West Midlands**

Bedworth U.D. (No. 4).

**Outside the Black Areas**

Easthampstead R.D. (Bracknell Nos. 2 and 3), Hebden Royd U.D. (No. 1), Lees U.D. (No. 1), Oxford C.B. (No. 12), Portsmouth C.B. (No. 1), Watford B.C. (No. 9).

**\* SMOKE CONTROL ORDERS WITHDRAWN**

**Outside the Black Areas**

Swadlincote U.D. (Nos. 5 and 6).

**NORTHERN IRELAND NEW SMOKE CONTROL ORDERS IN OPERATION**

Antrim R.D. (No. 2).

**NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION**

Belfast C.B. (VAR) (No. 8).

**NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED**

Newtownabbey D.C. (No. 8).

**SCOTLAND**

**NEW SMOKE CONTROL ORDERS IN OPERATION**

Edinburgh (Colinton No. 2), Hawick (No. 2 West End).

**NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION**

Ayr County (Crosshouse), Ayr County (Dundonald No. 1), Bishopbriggs (Brackenbrae/Kenmuir), Clydebank (No. 11 Dalmuir), Paisley (Craigielea No. 15 and White Haugh No. 16), Rutherglen (Gallow Flat No. 1), Hamilton (No. 4 Whitehills).

**NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED**

Falkirk (No. 11).

# BOOK REVIEWS

## 109th Annual Report on Alkali, &c Works 1972

*Dept. of the Environment, Scottish Development Dept., Welsh Office. HMSO, 90p.*

"Heartening" improvement in emissions from the ICI chemicals complex at Billingham and the virtual elimination of the once notorious "Teesside Mist" are highlighted by Mr F. E. Ireland, HM Chief Alkali and Clean Air Inspector, in his annual report for 1972.

"In the last five years 98 per cent of the dust, 97 per cent of the sulphur dioxide and 95 per cent of the ammonia emissions have been stopped. The site conditions are quite changed in appearance and the surrounding area is most markedly improved."

In a section subtitled "A Teesside Story", Mr Ireland reviews the history of the developments at Billingham using indigenous anhydrite and coal and the changes which took place to form the modern ICI chemical complex. The battle against air pollution was helped by the change from coke ovens to the ICI steam-naphtha reforming process and culminated in the changeover in 1971/72 to natural gas as a source of fuel and chemical raw material.

"When the last ton of coal was burned on the Billingham site on 5 August, 1972, some 36,000 tons per year of sulphur dioxide and large tonnages of ash derived from coal had been finally eliminated from the atmosphere. The company's routine determinations of dust depositions and ground-level concentrations of sulphur dioxide at monitoring stations surrounding the site have shown enormous improvements in recent years in parallel with these drastically reduced emissions."

Referring to the excessive ammonia emissions which used to exaggerate the local susceptibility to mistiness under certain atmospheric conditions to create the critical problem of "Teesside Mist", Mr Ireland recalls the formation of an inter-Departmental Committee to study the problem with the collaboration of the UK Atomic Energy Research Establishment at Harwell. "It is only necessary here to say that the expectations arising from this research have been realised. Now that ammonia leakages have been stopped, the densities of mists have been substantially reduced and the major problem has disappeared. No serious mists have been experienced for two years."

Mr Ireland also refers to the organisation set up by the company to carry out its own environmental controls. "It is this group which has established formal and regular contacts with the appropriate officers in the local authorities. This represents a practice which has been advocated repeatedly in my annual reports."

Turning to iron and production, Mr Ireland points out that one of the outstanding problems of steel refining

is the containment of fumes and this is especially so with large electric arc furnaces. "The Templeborough, Rotherham, works of the British Steel Corporation is particularly troublesome with its six large furnaces, and pilot scale work has been conducted over the past two or three years on hooding of the furnaces above the crane gantry to extract the escaping fumes. Now that problems have been solved, it has been possible to design a full scale extraction system. The estimated cost of the extra equipment is £2.2m, which will be additional to the existing arrestment plant which has cost nearly £2m. When the scheme is completed the estimated efficiency of fume arrestment is 99.85 per cent."

In previous reports the Chief Alkali Inspector has frequently referred to coke ovens as uneasy neighbours and this still remains the case. It is an international characteristic. After the Inspectorate had studied the problems of coke ovens from 1958 onwards and had discussions with representatives of the industry, a code of good practice was drawn up and it was published in booklet form in 1963 for the benefit of the industry and the Inspectorate. A revised second edition is now reproduced as an appendix to the report. Inspectorate staff in the field have been carrying out a vigorous campaign of assessing leakages, practices, maintenance, training and supervision in conjunction with works managements. "These campaigns are repeated at intervals of a few months to note progress and to spur the laggards." Closures of gasworks continued during 1972 as supplies of natural gas were more widely distributed, and in 1971/72 there were only 96 gasworks operating compared with 118 in 1970/71, 463 in 1958/59 and 1,050 in 1949.

The cement industry spent £1,266,000 on air pollution control in 1971 compared with £960,000 in 1970 and £452,000 in 1962. Direct depreciation on dust arrestment plant for 1971 was £684,000, increasing the total revenue expenditure for that year to £1,950,000, which, if research and development are added, comes to a total of £2,209,000, more than double what it was in 1968.

Recognising the importance of odours as a major pollutant, the Department of the Environment set a working party to study the problems and make recommendations. £100,000 has been set aside for scientific back-up. Meanwhile several local authorities have become disturbed by the mounting complaints against odours from animal waste treatment works, and a number have had recourse to legal action, with the possibility that works may have to close.

"This is a dangerous situation" says Mr Ireland, "because without these works the country could find itself in a real mess. A major factor in minimising odour is the local availability of animal waste treatment works so that offal and the like can be quickly treated before putrefaction becomes appreciable."

The total number of visits and inspections made by the Inspectorate during 1972 was 13,112 compared with 9,782 in 1971. Of this total, 321 were to, or in connection with, works not registered under the Alkali Act and 33 were concerned with radioactive emissions. Visits by members of the Inspectorate to unregistered works are solely advisory. Processes examined included organic odours from a variety of activities, smoke and acid soots from combustion of fuel, incinerators, paint spraying and vitreous enamelling abrasives, foundries, mobile stone coating plants, metal preparation and treatment, animal waste treatment, car breaking and burning, lead melting, food preparation, weedkillers, non-ferrous metals, starch, diesel smoke, illegal cable burning, a dental laboratory, waste disposal, rubber curing, fabric treatment, waste tar disposal and a brewery.

Mr Ireland's report is as readable as ever and we commend it to every reader of this journal.

Reader Enquiry Service No. 7396

### Air Pollution and Atmospheric Diffusion

*M. E. Berlyand, Editor, Israel Programme for Scientific Translations and John Wiley & Sons.*

The opening chapter of this collection of essays says that studies of diffusion of pollutants began in 1963. The author, who is the editor, can speak for himself: indeed he does write as if he were about as aware of criticism as an Old Testament prophet. His statement of the problem is about as naïve as that of a newly fledged European bureaucrat. His formulas are brim full of fudge factors and have mathematical form which makes extrapolation beyond the observations quite wrong. He does not reveal the measurements but expects us to believe that oddly shaped curves represent a relationship between static stability and wind speed. (It is clear that no relationship exists because there are four widely spaced curves for two extreme seasons and for stable and unstable cases.)

The publishing organisation, which claims to have translated half a million pages so far, seems to lack all discrimination. This book may well have been a useful exercise for the community newly concerned with industrial air pollution which produced it; but the translation is an invasion of Russian privacy. Such gems of wisdom as "... we can therefore assume that the state of the atmosphere in this region (Scandinavia) is near to the natural state" from the chapter entitled "The Laws of variation in pH in atmospheric precipitations" are scarcely helpful.

The most serious criticism of the book is that no effort has been made by the publisher of the translation to make it useful. There is no index. There are no summaries of the chapter contents. The 19 chapters are not numbered and do not follow any particular sequence of ideas. There is no introduction, no statement of the book's purpose or achievements. The writing is often very tedious, particularly where the translator does not fully appreciate the issues involved or where the style is pontifical and the substance unsatisfactory. The references are not organised and often the text is pretty useless because they are not to hand, and one certainly has the impression that it would not be worth inspecting them even if they were.

It is not good to be complacent about our own achievements and therefore this book is a 'must not' for UK readers. Time is easily better spent elsewhere.

*Professor R. S. Scorer*

Reader Enquiry Service No. 7397

### The Electricity Council Annual Report and Accounts 1972-1973

*HMSO, £1.50.*

### Central Electricity Generating Board Annual Report and Accounts 1972-1973

*Volumes 1 and 2 price £1.00 net each.*

#### Finance

The industry's profit, after interest, of £2 million compared with a loss of £23 million in 1971-72; the operating profit earned was £299 million (1971-72 £259 million), representing a 5.8 per cent return on average net assets during the year. Unit sales of electricity increased by 7.6 per cent and income rose by 9.7 per cent to £1,718 million due to higher sales and the modest tariff increases applied by Area Boards during the first quarter of 1972. Area Boards' contracting and appliance sales businesses showed a net profit of £13 million after deducting estimated costs of rents, rates and insurances as compared with £6 million in 1971-72. Turnover increased from £159 million to £188 million and the profit margin was 6.7 per cent compared with 4.1 per cent despite the fact that inflation has affected the overhead charges applied to these activities.

#### Sales

Sales of electricity are particularly dependent upon the level of national economic activity. During 1972-73 overall economic activity increased over the previous year, although this varied in certain sections and areas. Total sales rose to 191,159 million kWh, with off-peak sales representing 11.1 per cent of the total. After allowing for the differences in weather between the two years and for the effects of the mineworkers' strike of February 1972, the corrected growth of sales was 5.1 per cent. The number of customers rose by 226,000 to 18,925,207. Sales of most domestic appliances through Area Board shops either maintained 1971-72 levels or improved on them.

Price restraint imposed between 1970 and 1973 has cost the industry at least £165 million in lost revenue. The Boards' Contracting and Appliance Sales activities suffered less noticeably from the overall effects of price restraint, although their operating, selling and other costs continued to reflect the impact of inflation.

#### Generation

In 1972-73 all demands for electricity by Area Boards and other consumers were met but growth in demand and energy supplied was less than expected.

Winter peak demand met exceeded 40,000 MW for the first time in the Central Electricity Generating Board's history, the peak (40,639 MW) occurred in January 1973. Annual load factor (the ratio of average load to maximum load) rose from 54.9 per cent in 1971-72 to 58.3 per cent in 1972-73. Maximum demand would have been about 2,500 MW higher if average winter cold spell conditions had been experienced at the time of peak demand.

Following the passing into law of the Coal Industry Act, 1973, an agreement was reached between the National Coal Board and the Central Electricity Generating Board which will result in more coal being burned at power stations in 1973-74. The agreement emphasizes the fact that, if the price is right, the Central Electricity Generating Board can step up their system coal burn substantially without building more coal-fired plant. Two-thirds of the Board's generating capacity is coal-fired, and in the last decade well over £1,000

million have been invested in this form of generation. The Board's purchases of NCB coal totalled over £340 million in 1972-73, and they will remain the coal industry's largest customer indefinitely.

Steady progress was made on the construction and working up of full output of new plant, in spite of setbacks which included major and grievous failures of large individual sets at Didcot, and, at the end of the previous year, at Aberthaw B.

Two important developments during the year were the decision reached by the Government on the re-organization of the nuclear design and construction industry, which was welcomed by the Board, and the Board's promotion of a Private Parliamentary Bill to establish a large hydro-electric pumped storage scheme at Dinarwic in North Wales.

Reader Enquiry Service No. 7398

### **National Coal Board Report and Accounts for 1972-1973**

*HMSO, £1.50.*

From time to time a particular year coincides with a clearly-defined phase in an industry's history. For the coal industry 1972/3 was a year of recovery. The seven-week strike which ended in February 1972 had left the industry in a seriously weakened condition. What then happened was possibly one of the most remarkable examples of industrial co-operation in recent times. Both management and unions committed themselves to restoring the strength of the industry and confidence in it.

There is no doubt that the positive and constructive approach demonstrated by the industry's joint plan played a big part in persuading Parliament that the help being sought was both desirable and justified; and it was eventually provided in the Coal Industry Act 1973. A Joint Policy Advisory Committee was established composed of members of the Board and national officials of the unions. Among other things this Committee approved the issue of a major document on coal and energy policy in Europe, reviewed the broad objectives for the industry during the ensuing financial year (1973/4), elaborated and supported a joint sales drive involving all those employed in the industry, and analysed in detail the problems associated with increasing productivity, maintaining quality standards and raising efficiency generally. Finally, to involve as many men as possible in the progress of their own pit and to contribute their practical experience to the solution of its problems, arrangements were made to hold extended meetings of Colliery Consultative Committees attended by workmen who were not members of the Committee.

The response to all these attempts to achieve a better spirit in the industry was good and formed the basis for the industry's much improved performance.

Comparisons with 1971/2 are affected by the aftermath of the strike. Nevertheless, results during the second half of the financial year showed a big and real advance. Productivity was exceeding last year's by a healthy margin and frequently reached record levels. Outputs were good. Consumers' stocks had quickly been restored to safe levels and coal sales continued to be strong. The final deficit of £84m. was about £20m. less than the initial estimate submitted to the Government following the strike and the Wilberforce wages settlement.

Deepmined output in 1972/3 increased by nearly 21m. tons compared with 1971/2. During the year, total capital investment at collieries was £68m., compared with £55m. in 1971/2, the increase being due mainly to inflation and the effect of the strike on the spending in 1971/2.

Production of opencast coal was marginally higher than in the previous year. Profits, which in 1971/2 were badly affected by the high level of stocking, rose substantially.

The Board have set up an Environmental Policy Group to co-ordinate work combating air, water, noise and visual pollution, to advise on all the related problems and to recommend appropriate policies and the means of their implementation, for example the use of materials once considered as waste.

During the first weeks of the year, coal consumption at power stations was restricted below the commercial level, owing to the need to rebuild stocks after the strike; otherwise, it would have exceeded 70m. tons for the year under review. Disposals of coal to coke ovens were 3m. tons higher than in 1971/2.

Disposals to the industrial market were almost the same as in the previous year which included the strike period. Consumption fell by 2m. tons partly because of conversions to other fuels and partly because demand was depressed by the low level of industrial activity during most of the year and the relatively mild winter.

Domestic consumption was the same as in the previous year. Despite difficulties in meeting merchants' demand in the post-strike period, 5½m. tons of house coal was supplied by the Board in the first half of 1972/3.

During the year negotiations took place between the Board, other smokeless-fuel producers and the distributive trade, with the aim to rationalising and improving the service to domestic customers and co-ordinating promotional campaigns. These negotiations resulted in the setting up on 1 January, 1973, of the Solid Fuel Advisory Service.

The Board's retail service sold 0.8m. tons of solid fuel direct to the public compared with sales of 0.7m. tons in 1971/2, when results were affected by the strike.

Having proved the value of their policy of working hard for closer co-operation, the Board are hopeful that the improved trends so strongly established in 1972/3 can continue. Their aim will be to maintain within the industry the better relationships now re-established, and to take full advantage of the new prospects for coal within the developing world energy situation.

Reader Enquiry Service No. 7399

### **The British Gas Corporation Annual Report and Accounts 1972-1973**

*HMSO, £1.50.*

The report covers the first three months' working of the British Gas Corporation, which replaced the Gas Council and the Area Boards, from 1 January to 31 March, 1973—and the activities of the Gas Council and the Area Boards for the previous nine months.

The Corporation was set up by the Government under the 1972 Gas Act and it has a duty to develop and maintain an efficient, co-ordinated and economical system of gas supply for Great Britain, and to satisfy, so far as it is economical to do so, all reasonable demands for gas.

Sales of gas reached a record level of 10,180 million therms—an increase of 27 per cent over the previous year. The average daily quantity of gas sold during the year was equivalent to 2,800 million cubic feet of natural gas. Appliances belonging to 16 per cent of customers were converted to burn natural gas bringing the total to 61 per cent—8,098,000. The consolidated net profit was £5.7m. despite estimated direct costs of this year's industrial dispute of £8m. and no increase in gas prices during the year.

#### *Financial Results*

The consolidated net profit was £5.7m. The Gas Council and Area Boards had a combined surplus of £15.1m. for the previous year. This year's surplus represents 0.6 percent of total turnover which was £897.5m. Major factors influencing the financial results were: an increase in gas sales of 27 per cent; a reduction in the overall cost of gas supplied per therm of 0.47p for 7.64p to 7.17p; a reduction in the average income per therm of gas sold of 0.61p from 7.83p to 7.22p; the industrial dispute which affected gas sales, customer service, conversion and appliance marketing—it is estimated that the direct cost of this dispute was about £8m. in 1972/73.

Capital expenditure during the year was £125.3m. and the cumulative costs of conversion to 31 March, 1973, were £324.6m.

#### *Offshore and On-shore Exploration and Development*

The Corporation continued its participation in exploration activities in the UK sector of the Continental Shelf through interests held by its subsidiary companies Gas Council (Exploration) Ltd and Hydrocarbons Great Britain Ltd.

Further seismic surveys were carried out during the year under various agreements between Gas Council (Exploration) Ltd and companies, including BP Petroleum Development Ltd, Home Oil of Canada Ltd, and ICI Ltd. These surveys covered parts of Cheshire, Hampshire and Yorkshire. A marine seismic programme was held in the North Minch, Scotland.

#### *Environment*

Natural gas is an extremely clean fuel, with virtually no sulphur content. The rapid growth in the use of gas appliances and installations has made a contribution to a cleaner environment. The reception and bulk transmission of natural gas and its distribution to customers involves limited above-ground installations compared to manufactured gas. The transmission and distribution are underground. The number of gasworks had been cut to 81. There will be further reduction as the conversion programme nears completion.

#### *Gas Sales*

Total gas sales reached 10,180 million therms—a 27 per cent increase over the previous year, which was itself a record. The marketing of gas during the year continued to reflect the expansion envisaged in the development plan prepared in 1968.

The rate of domestic expansion may fall as saturation of the gas fire and then the central heating market in existing homes is approached. The marketing emphasis will then turn gradually towards replacement appliances and the new leisure market, with gas sales expansion coming mainly from new housing and increased use of existing appliances.

#### *Domestic Marketing*

Domestic sales were 4,603 million therms, an increase of 14 per cent on the previous year. New central heating installations reached more than 500,000—an increase

of 27 per cent. About three out of five people who bought central heating in areas of gas supply chose gas. There are now more than 3 million gas systems in use.

Gas fire sales were buoyant. Cooker sales to the end of December were 6 per cent up. The industrial dispute, however, severely restricted sales of all appliances. Taking the year as a whole, parity or sales increases were achieved in most product groups.

#### *Industrial*

Industrial gas sales increased by 48 per cent on the previous year. Sales in both firm and interruptible sectors increased in line with the planned expansion programme. Reader Enquiry Service No. 73100

#### **New additions to the National Society of Clean Air Library, available on Loan**

**Co En Co.** Transport, the Environment and the European Economic Community.

**Thames-Side Committee for the Abatement of Atmospheric Pollution.** Dust Gauge Readings, confirmation notes on Thames-Side and Medway Dust.

**U.S. Environmental Protection Agency.** Background Information for Proposed New Source Performance Standards. Volume 1, Main Text.

**U.S. Environmental Protection Agency.** Federal Register, Standards of Performance for New Stationary Sources, Part II.

**Verein Deutscher Ingenieure.** Carbon Monoxide, Origin, Measurement and Air Quality Criteria.

**U.S. Environmental Protection Agency.** Air Pollution Abstracts Index, 14081-20048.

**National Coal Board.** Reports and Accounts 1972/73.

**The Electricity Council.** Annual Report 1972/73.

**C.E.G.B.** Annual Report, Volume I & Volume II.

**Department of the Environment, Scottish Development Department, Welsh Office.** 109th Annual Report on Alkali & Works 1972. HMSO, 90 pence.

**The North Western Branch of the Institution of Chemical Engineers in association with The University of Salford.**

The Control of Gaseous Sulphur Compound Emission, volume 3, reported proceedings, discussion, session 6. International Conference 10-12 April, 1973.

**Beryland, M. E., Editor.** Air Pollution and Atmospheric Diffusion. John Wiley & Sons.

**The Gas Council.** North Sea Heritage, The Story of Britain's Natural Gas.

**U.S. Environmental Protection Agency.** Air Pollution Aspects of Emission Sources: Primary Lead Production, a Bibliography with Abstracts.

**U.S. Environmental Protection Agency.** Air Pollution Aspects of Emission Sources: Primary Aluminium Production, a Bibliography with Abstracts.

**U.S. Environmental Protection Agency.** Air Pollution Aspects of Emission Sources: Primary Copper Production, a Bibliography with Abstracts.

**Pollution Prevention Panel.** Liaison between Industry and the Local Authority, Coventry.

**U.S. Environmental Protection Agency.** Nationwide Air Pollution Emission Trends 1940-1970.

**U.S. Environmental Protection Agency.** Compilation of Air Pollutant Emission Factors; second edition.

**Coles, R. R., and Shak, B. J. J.** The Measurement of Particulate Immisions and Emissions. British Steel Corporation.

**Society of Chemical Industry.** Conserving our Resources—the Contribution of Chemical Technology. Conference Proceedings held at Trinity College, Cambridge, England, 26-28 March, 1973.

**The Filtration Society.** What's new in Dust Control and Air Cleaning. Pre-prints of Papers of Conference, 25-27 September 1973.

"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## Third International Clean Air Congress, Dusseldorf, 8th-12th October 1973

The Third International Clean Air Congress was held at the Congress Centre, the New Exhibition Grounds, Dusseldorf, from the 8th-12th October 1973. The Congress was attended by some 1,500 delegates from 42 nations; over a period of four days, 180 papers were presented and discussed at four simultaneous sessions almost all of which were well attended. Although there were fewer delegates and fewer papers than at the previous International Conference in Washington, the size of the Conference still serves to show the world-wide interest in problems of clean air.

Many of the papers presented had a good scientific value though some of the information contained therein had already been published elsewhere. One pleasing feature was the number of papers presented by younger people of all nationalities.

The Conference was sponsored by the Reinhaltung der Luft of the Verein Deutscher Ingenieure and planning for the Conference had been going on for nearly three years. Under a central programme committee, national programme committees for selection of papers were set up in the various countries and among the subjects covered were emissions from industry and domestic heating and abatement procedures; the effects of air pollutants on man, animals, plants and goods and air quality criteria and ambient air threshold values; measurement techniques; the dispersion of air pollutants, clean air policy and implementation measures; meteorological influences; legislation; public awareness, education and training; air pollution from road vehicles and aircraft. It could be said that the programme included something for everybody and this to a degree was true. But there was the difficulty that with four technical sessions going on simultaneously it was difficult for delegates to decide which session they would attend and which paper they wished to hear.

The Congress was opened on the morning of Monday, 8th October by Herr H. D. Genscher the Minister of the Interior for Federal Republic of Germany. Delegates were welcomed by the Ober Burgermeister of Dusseldorf and Herr Heinz Kuhn the Minister for North Rhine Westphalia.

On the Monday afternoon at two o'clock, the first of the 28 technical sessions opened and these sessions continued until mid-morning on Friday, 12th October, when at the closing session the Congress was wound up by Professor Doctor Ing. Heinrich Schackmann, the President of the International Union of Air Pollution Prevention Associations and the former President Dr. C. E. Barthell of the United States of America; the principal address was given by Doctor Helmut Grunewald. What to many was a novel feature of this closing session but

which added enormously to its enjoyment was a string quartet from Duisburg which played music by a Haydn and Telemann; to some delegates the performance of the string quartet was the most interesting part of that particular session!

Great Britain contributed only six papers although more had originally been submitted and it was perhaps unfortunate that the international committee decided to omit some papers which the national committee had thought very worthy of presentation.

An interesting feature of the Congress was the "Information Show" for children specially arranged and sponsored by the German Government. This exhibition, using every known audio and visual aid, showed the dangers of noise and of pollution of air, water, sea and land, and possible cures. In addition there were actual experiments and processes being carried out, one of the most noteworthy being the purification of water from the river Rhine to the state when it was fit to drink. One very interesting and attractive feature was a marionette show; this always had a large, enthusiastic audience.

In addition to the programme of technical sessions there was the usual social activity with events to suit all tastes. Those who had already arrived in Dusseldorf the day before the Conference opened were received by the President of the West German Republic at his home in Essen on the Sunday afternoon. But one of the most interesting features was the special trip arranged by river steamer through the heart of the industrial Rhineland. Here it was possible to see not only industry working at its full potential but also to see pollution, to smell it, to taste it and hear it! It served as a salutary reminder that the main task for us all is to clear up such pollution. Technical papers which might be described as "more and more about less and less" are all very well and are very necessary. But the main concern is still that effort should be put into clearing up pollution; the danger with International Congresses such as this is that sometimes one fails to see the wood for the trees.

Concurrently with the Congress was held Envitec '73, a vast international exhibition covering all aspects of the control of pollution and the preservation of the environment. The British Joint Venture Stand was sponsored by the Society and 12 firms and organisations were represented: Airflow Developments Limited, Airmaster Engineering Limited, APCO, Fleming Instruments Limited, Hygrotherm Engineering Limited, Intellogic Limited, Lodge Cottrell Limited, Metro-Flex, P. & S. Textiles, Redman Heenan Froude Limited, the Warren Spring Laboratory, and the Safety in Mines Research Establishment.

The Exhibition was visited by most of the delegates and by a reasonable number of the general public and the British Stand received a fair measure of support. The Information Section of the British Stand, which was manned by staff of the Society, was kept very busy and in providing information about the control of pollution in the United Kingdom and in distributing pamphlets and selling publications.

## GREECE

To preserve the beauty of Athens from the dangers of pollution, an agreement was signed in Greece between the Government of Greece, the United Nations Development Programme (UNDP) and the World Health Organisation (WHO).

The aim of this co-operative venture, in which WHO will act as executive agency, is to facilitate the economic development of the Athens metropolitan area while preserving and improving the quality of the environment.

The project covers sewage disposal, coastal pollution, air pollution, collection and disposal of solid wastes, and noise.

The capital's comprehensive plan for environmental pollution control is also to serve as a model for the development of policy, legislation and action for the entire country.

Total cost of the Athens project is estimated at more than \$4 million, of which the UNDP will contribute \$1 million.

Monitoring networks will be established to assess the degree, causes and trends of pollution in the Athens area. Equipment has been purchased and installed, laboratories and offices equipped, and staff are being hired.

The project manager has already taken up his duties in Athens. He is Alexander Gilad, formerly in the environmental health unit at WHO's Regional Office for Europe in Copenhagen. The co-manager is Mr Markantonos, a Director in the Ministry of Social Services of Greece.

## UNITED NATIONS

Studies on the effects on the environment of the iron and steel, rubber and leather industries are among six projects on the environmental aspects of industrial development which the United Nations Industrial Development Organisation (UNIDO) will carry out with the financial assistance of the United Nations Environment Programme (UNEP).

UNIDO has also undertaken to include environmental topics in some of its training programmes, as well as to carry out studies designed to minimise pollution in integrated industrial complexes. Ways of ensuring that environmental considerations are built into new industrial development projects will be examined through a series of case studies.

In the joint programme developed by the two organisations as a result of last year's Stockholm Conference on

the Human Environment, priority is being placed on the conservation and rational utilisation of local resources, the location and design of new industries, and the development of products whose use and disposal will entail the least possible pollution.

The study on the rubber industry will compare natural with synthetic rubbers and analyse their impact on the environment, serving, it is hoped, as a model for future studies on other natural versus synthetic products. In its examination of the leather industry, UNIDO will assess the impact on the environment of the untreated effluents produced in the leather tanning process. The purpose of the study on integrated industrial complexes is to find ways of cutting down wastes and promoting fuller use of their resources.

The project on the environmental considerations in the iron and steel industry involves the preparation of a paper on pollution and environmental controls to be presented at the UNIDO-sponsored Third Interregional Iron and Steel Symposium to be held in Brasilia, Brazil. Information will also be gathered at the Symposium and subsequently on the relative success and cost of environmental technology in existing steel plants in both developing and developed countries.

In addition to examining the effects of giving insufficient consideration to environmental factors in an existing industrial unit and proposing ways of including them, four case studies are designed to ensure that environmental considerations are incorporated into future UNIDO projects.

## SPAIN

A banned pesticide may have killed as many as 50,000 birds and some animals in the Coto Donana nature reserve. There are fears that the death toll might soar by thousands as birds migrating from northern Europe arrive to spend the winter in Spain.

## UNITED STATES

Gasoline mileage data have been released for 1974 cars tested under the Environmental Protection Agency's emissions standards compliance programme. Most economical on the initial test report, at 29.1 miles per gallon, was a £2,000 Honda Civic (76 cubic inches, manual 4-speed transmission). By comparison, in the £5,500 category, the Oldsmobile Toronado (455 cubic inches, automatic 3-speed transmission) was rated at 6.8 miles per gallon.

The data results from an Environmental Protection Agency test where a car is placed on a dynamometer that simulates urban driving conditions covering a 7.3 mile trip at speeds up to 57 miles per hour.

The mileage data has been sent to auto manufacturers for voluntary use on window labels developed for EPA's programme for posting gas mileage on all new cars. Auto manufacturers that will participate in the programme include: General Motors, Ford, Chrysler, International-Harvester, Volkswagen, Datsun, Alfa Romeo, Daimler-Benz, Volvo, Toyota, Saab-Scania, British Leyland, Subaru, Lotus, Mitsubishi, BMW, Toyota, Renault and Honda.

# AIR POLLUTION ABSTRACTS

Papers presented to the 40th Annual Conference of the National Society for Clean Air, Torquay, 15-19 October 1973.

**1303 Smoke Control—A Stock-taking of the Present Position.** Moss, Mrs. A. Using diagrams and tables, the author describes in detail the smoke control position as it is today. Progress in smoke control depends on many variables—size of the local authority, its position in relation to other authorities, its geographical situation and the density of population. Many of the largest authorities, including most of the County Boroughs and half the London Boroughs, have not yet completed their programmes, but the majority of authorities for whom smoke control is appropriate are somewhere along the road to completion. The prospect of local government re-organisation seems, on the whole, to have stimulated smoke control, but how smoke control will be affected after the new authorities come into being is not known. The author feels that it is unlikely that smoke control will ever be completed, to the extent that all houses in the county will be covered. But smoke control in the black areas, and those areas outside the black areas where the local authority consider that smoke control is necessary, will eventually be completed, leaving only occasional smoke control areas to be made when, for instance, a new town is developed.

**1304 The Invasion of the South West's Environment.** Sayer, Lady, and Turnbull, P. Lady Sayer states that in no field has the Environment Ministry's lack of true concern for the environment been shown more clearly than in its present-day attitude to national parks, those few remaining areas of wild land in our small island which, just after the Second World War, people recognised as being immensely important to the nation's health and well-being. Lady Sayer explains in detail the problems of preserving these national parks and looks closely at some of the pressure put on Dartmoor which, with Exmoor, is the only surviving area of wild country south of a line drawn from the Severn to the Wash.

This paper presents the existing situation in the south west. Mr. Turnbull discusses the environment and its diverse features—the motorway and trunk road programme and the

disparity of population—the south west today is the second fastest growing area in the country. Mr. Turnbull discusses possible ways of solving the various problems and outlines the steps already taken.

**1305 Control of Emission from Combustive and Non-Combustive Sources.** Darby, K., and Parker, K. R.

This paper deals with the control of particulate emission from industrial processes, both of a combustive and non-combustive nature. The various devices available for control of dust emissions are discussed with their operating characteristics under different conditions. Reference is also made in the case of the wet systems to the avoidance of secondary pollution problems. The application of these devices to industrial processes is discussed but, as much has already been written on the subject—for power station boilers, incinerators and the larger, more common, industrial applications—reference is confined to some of the more specialised and less well-known gas cleaning problems.

**1306 Living in Polluted Cities.**

Amos, F. J. C. The author looks at this problem in detail and examines the various types of pollution. The chief sources of which in cities are industrial emissions, human waste in the form of sewage, the motor vehicle and other waste, refuse and litter. If cities are to become less polluted, says the author, some thought must be given to how these sources may be effectively controlled. The author concludes that a clean environment could mean that some goods will cost more; other goods will not be available and some people will have to find new kinds of work. In its blind search for greater material wealth, western society has gone a long way to destroying the environmental qualities which it now seeks. In one way or another it will have to pay the price.

**1307 Pollution and Health.** Murray, Dr. R. Dr. Murray argues that there will always be some pollution in the air, some of it natural and some of it man-made, but if the air we breathe is contaminated, this can lead to, not only damage to the lungs and respiratory organs but also, through absorption, to damage of other organs such

as the liver. Dr. Murray discusses examples of such damage together with levels of pollution in industry and future levels. He also considers the cost.

**1308 The Effect of Some Air Pollutants on Farm Animals.** Jones, Dr. L. H. P., and Cowling, D. W. This paper is divided into two sections. First, the authors present a general background and, secondly, they deal with some important pollutants. Interest in the effects of air pollution on animals has arisen primarily as a consequence of concern about human health. This had led to studies in which animals have been exposed experimentally to air pollutants, with the aim of defining the possible effects, including toxicity, of various known pollutants. Interest has also arisen because of the high mortality rates that have been observed in some animals during some major air pollution episodes and animal disorders occurring in areas close to some industrial complexes.

**1309 The Effects of Pesticides on Soil Animals.** Newman, J. The author states that about ten years ago, when concern for the environmental effects of the use of persistent pesticides in agriculture was growing, it was often stated that powerful biologically active chemicals were applied to the soil with little knowledge of their ultimate fate or of the effects which they might produce on the natural fauna of the soil. But today the situation is very different and the author discusses the methods of investigation, the effects of pesticide treatment, insecticides, fungicides and herbicides.

**1310 Effects of Nitrates on Farm Animals.** Walters, A. H. The author develops his theme starting from the natural biocycle, via food production and water contamination, on to the effects of nitrates on farm animals. He then shows where it fits into the total ecological scene. Mr. Walters concludes that in the U.K. acute nitrate poisoning of farm animals does not appear to be a widespread menace; but at sub-acute levels it may be a mounting problem connected with not only environmental pollution, but also with the politics, economics and technology behind the total ecological scene.

# National Society for Clean Air

136 North Street, Brighton BN1 1RG (Brighton 26313)

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### **YORKSHIRE**

J. H. Wyatt, Health Dept., 12 Market Building, Vicar Lane, Leeds 1  
30211, Ex. 59)

### **EAST-MIDLANDS**

E. F. Raven, Divisional Inspector, Smoke Control, Public Health Dept., County Borough of Derby, Castlefields House, Main Centre, Derby DE1 2FL (Derby 31111)

### **WEST-MIDLANDS**

Acting Secretary: S. Cayton, P.O. Box No. 47 Town Hall, Lombard Street West, West Bromwich.

### **SOUTH-EAST**

R. F. Shapter, F.A.P.H.I., Public Health Dept., 8 Easton Street, High Wycombe (High Wycombe 26100)

### **SOUTH-WEST**

D. J. Barnett, Chief Public Health Inspectors' Office, Union House, Union Street, Bristol BS1 (0272 26241).

### **SOUTH WALES and MONMOUTHSHIRE**

L. Morgan, 9 Lodge Drive, Baglan, Port Talbot (5231)

The parent of the Society was the Coal Smoke Abatement Society, established in London in 1899. It did valuable pioneering work and accomplished the first necessary stage of making it understood that clean air was not the pet notion of a few cranks. It co-operated with a provincial association that had been formed in 1909—the Smoke Abatement League of Great Britain. These two bodies amalgamated in 1929 to form the National Smoke Abatement Society. This name was retained until 1958, when it was changed to the present one.

From a handful of individuals the Society's membership has grown to include not only considerable private membership both at home and abroad, but membership of local authorities, corporate bodies, (representing the Learned Societies and Institutions),

the fuel industries and those industries concerned with the production of appliances and equipment connected with clean air.

The Society is a voluntary body and receives no official grant, and therefore essentially subsists on the subscriptions of its members. The general policy of the Society is Directed by the Executive Council and its Committees. There are twelve Divisional Councils of members, with their own committees and honorary officers.

The Society's objects are, in brief, to promote and create by publicity and education an informed public opinion on the value and importance of clean air and to initiate, promote and encourage the investigation and research into all forms of atmospheric pollution in order to achieve its reduction or prevention.

## Membership of the Society and Subscriptions

Membership of the Society is open to any individual, corporate body or local authority. Subscription rates are given below.

### **Individual Members**

Not less than £3. Subscriptions can be paid by Covenant, minimum of seven years at £1.83, the balance being recoverable from the Inland Revenue by the Society. Those Members wishing to pay their subscription by Bankers order or wish to Covenant with the Society are requested to apply for the necessary forms for completion.

### **Local Authority Members**

Population	£	
Less than 25 000	10	appointing 2 representatives
25 001 to 50 000	13	appointing 2 representatives
50 001 to 75 000	17	appointing 2 representatives
75 001 to 100 000	23	appointing 3 representatives
100 001 to 175 000	35	appointing 3 representatives

175 001 to 250 000	40	appointing 4 representatives
250 001 to 375 000	45	appointing 4 representatives
375 001 to 500 000	50	appointing 5 representatives
Over 500 000, £15 and 1 additional representative for each additional 1 000 000 of population or part thereof.		

### **Corporate Members**

Not less than £40 (appointing 4 representatives and 2 delegates in each appropriate division) or not less than £23 (appointing 2 representatives and 1 delegate in each appropriate division)

### **Associate Members**

Not less than £3

*Note:* The Society's subscription year commences 1st April.

National Society For Clean Air

# NEWS FROM THE DIVISIONS

## NORTH WEST

In appreciation of the enduring and valuable contribution they have made to the North West Division of the National Society for Clean Air, testimonials were presented to three past chairmen of the Division at its annual general meeting held in the Pembroke Hall, Worsley.

They were Norman H. Bridge, formerly assistant chief commercial officer of the North West Electricity Board, who was chairman from 1959-61; Allan Taylor, formerly regional smokeless fuels officer of the National

Coal Board and one-time district coke representative of the Ministry of Fuel, who was chairman from 1965-67; and Fred Winder, formerly chief public health inspector of Stockport, who was chairman from 1969-71.

The testimonials were presented by Mr. R. Hollingdale, commercial manager of the West Lancs Area of North West Gas, who is the present Chairman of the Division.

## SOUTH WEST

Mr. D. J. Barnett represented the National Society for Clean Air at the official opening of the Avon Rubber Company, Melksham, on the 2nd October 1973. The new Avon Technical Block which was opened by the Rt. Hon. Christopher Chataway, M.P., Minister for Industrial Development, represents a £250,000 investment by the company.

Scrap rubber tyres represent one of the most difficult present day disposal problems because of their vast numbers and also because of their size, shape and chemical composition.

The Lucas scrap tyre incinerator installed and operating at Avon Rubber is the most technically advanced process for this type of disposal currently used in the United Kingdom and, so far as is known, throughout the world. The furnace destroys 1,500 lb/hr weight of scrap tyres (about 100 average size tyres/hour) efficiently, smokelessly and without smell. Moreover, as a valuable bonus, the equipment produces 12,000 lb/hr of high pressure steam for factory use. The residue is only one-twentieth of the original tyre weight while the reduction in volume is even more pronounced—down to one-hundredth.



*From left to right: N. H. Bridge, R. Hollingdale, F. Winder, W. E. Pollitt and A. Taylor*

## City Council Unit Monitors Noise "Black Spot"

A special unit of Birmingham City Council is proposing to monitor traffic noise in sixteen houses along Tyburn Road, Erdington. This project began on Tuesday, 30th October.

People living in Tyburn Road have complained about the amount of noise from road traffic which they have to suffer since the M6 motorway nearby was opened in May 1972.

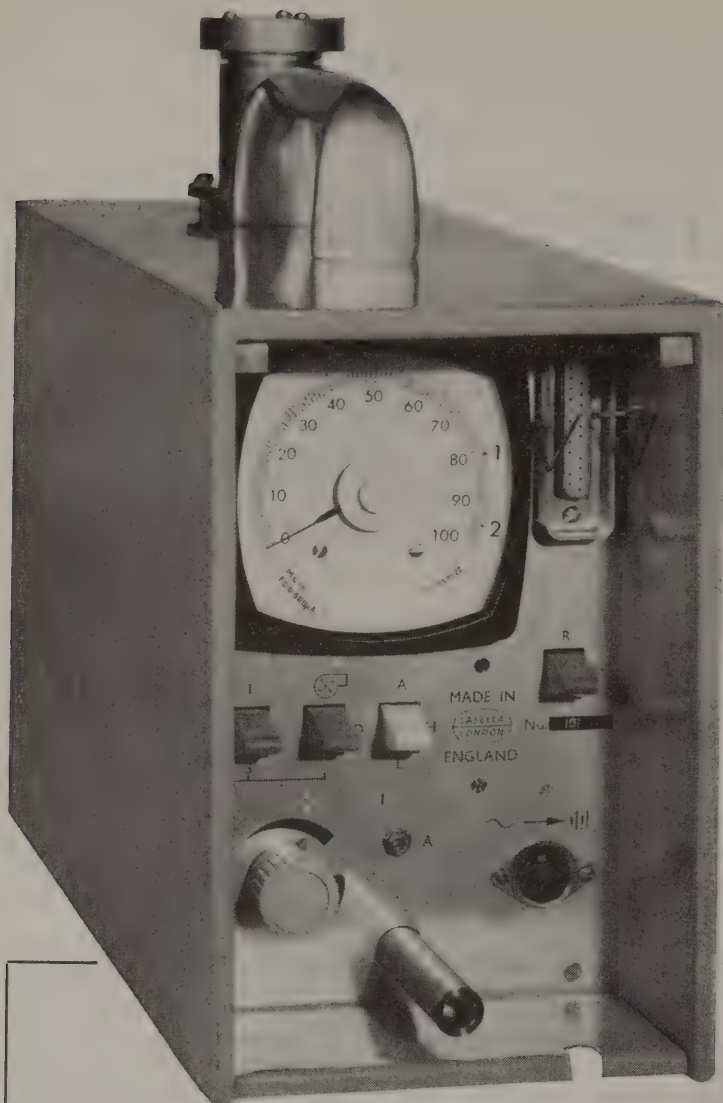
This project should provide the city council's Highways Committee's Road Improvements and Traffic Subcommittee with up-to-date scientific data on the problem of traffic noise. The actual work will consist of taking sound level readings. Measurements will be recorded over

a twenty-four hour period in each of the sixteen selected houses.

The city council section undertaking the work is the Environmental Protection Unit of the Public Health Department. It is the Public Health Department which is responsible for all traffic noise monitoring throughout the city and for the administration of any noise insulation schemes.

The Chairman of the Public Health Committee, Councillor John Charlton, says, "Ordinary people are becoming increasingly aware of how the quality of their lives is threatened by mounting pollution. It is the job of local government to respond to this concern. In order to do so effectively, however, it must make the best use of the scientific techniques available. I hope that this particular project in Tyburn Road will provide us with data which will help us to combat excessive traffic noise in the future."

# A NEW MINIATURE SO<sub>2</sub> SAMPLER



- Wide Range—0.005 to 500 ppm
- High Sensitivity
- High Accuracy
- Compact and Portable—13lb  
11 x 8 x 5 in.
- Battery operated—no external  
source of power required
- For short or long period  
monitoring (up to 24 hours)
- Simple to operate by semi-skilled  
person

## *Ideal for on-site surveys*

This new instrument combines high sensitivity and accuracy with portability, flexibility and wide range. Air is drawn through a miniature bubbler by a diaphragm pump driven by a constant speed motor. The quantity of SO<sub>2</sub> trapped in a very dilute hydrogen peroxide solution is estimated by changes of conductivity. An alternating voltage at the electrodes prevents polarisation of the electrolyte. The amplified signal is registered on a 270° taut band meter

with an effective scale length of 4½ inches. The range of concentrations is achieved by a dual electrode system having a sensitivity difference of about ten times. Two interchangeable bubblers further extend the range by ten times. A few minutes sampling gives a significant change in the meter reading so that a series of readings may be obtained on a single solution within the range of 1–500ppm. The larger bubbler gives readings from 0.005 to 0.5 ppm for up to 24 hours.



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## Industrial Mists

by Dr S. R. Craxford

On 19th September last a very interesting scientific symposium was held at Harwell on the physical and chemical mechanisms of the formation of what has been known for the last 20 years as "Teesside Mist". Towards the end of the meeting a question was asked about what lessons were to be learnt by local authorities responsible for dealing with air pollution problems in industrial areas, and the following notes have been written with this particularly in mind.

Teesside Mist was a white mist that, now and again, often in summer, used to fill the industrial valley of the Tees. This could happen when the surrounding countryside a mile or two away was enjoying bright summer sunshine. Long before the Harwell investigation started it was known that the occurrence of this mist corresponded to accidental leaks of ammonia from the Billingham works, and that the mist contained abnormally large amounts of ammonium salts. By its geographical situation Teesside is particularly subject to natural mist coming in from the sea, and it was well known that such natural mist—small water droplets suspended in the air—is stabilized and clears much more slowly than usual if salts of any sort are also present. The validity of these ideas has been very happily confirmed by the virtual disappearance of Teesside Mist as the works have been modernized, the leaks of ammonia very greatly reduced, and emissions of sulphur oxides also reduced so that the amount in the air that can react with ammonia to give ammonium sulphate is correspondingly less.

The lesson is, therefore, that in districts subject to natural fog industrial emissions of ammonia and of oxides of sulphur should be controlled much more strictly than may suffice elsewhere. Severnside (see below) and Immingham immediately come to mind as needing particularly careful control from this point of view.

The question has also been posed as to whether the general loss of amenity—reduced sunshine and below-average visibility—so common in industrial towns and conurbations may not be in some way related to the much greater loss of sunshine and visibility in Teesside Mist. Such a view is strengthened by conditions on Severnside where these amenities are very markedly reduced when compared with the immediate surroundings, and where the interaction of emissions containing ammonia and sulphur oxides can be observed visually. In general, on passing from the country into industrial areas, particularly in summer, there is a strong subjective impression that the loss of sunshine and of visibility cannot be due to smoke alone, but that stabilized mist, possibly sulphuric acid mist, is a major contributory factor. Until the blame has been firmly apportioned by more scientific work it would seem prudent to keep emissions of sulphur dioxide in such areas as low as is reasonably possible even though they do not give rise to ground-level concentrations directly injurious to health.

## Fuel Oil Firing and Natural Gas Firing Courses

The National Industrial Fuel Efficiency Services Ltd residential oil firing and natural gas firing courses will be held at the Lancaster Gate Hotel, 106 Lancaster Gate, London W2 3NU, and will take place as follows:

### *Oil Firing*

Course No. 2 February 18th-21st, 1974.

Course No. 3 April 22nd-25th, 1974.

The Fee for the course including accommodation and meals is £70.00.

### *Natural Gas Firing*

Course No. 2 January 21st-24th, 1974.

Course No. 3 March 25th-28th, 1974.

The Fee for the course including accommodation and meals is £85.00.

For further information write: Mr. L. F. Limmatt, National Industrial Fuel Efficiency Service Ltd., 54/58 Bartholomew Close, London EC1A 7HD. Tel.: 01-606 5906.



An advanced Combustion Technology expressly to reduce the industrial fuel oil costs, corrosion and maintenance expense, also air pollution.

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24 Hour Answering Service.

## LETTER

*The Editor,  
Clean Air*  
Sir,

Mr Leslie Davies chides me (summer issue 1973) for not giving more consideration to the contention that asbestos must now be considered an urban pollutant. The purpose of my letter, published in the March issue of "Clean Air", was briefly to draw the attention of readers of the Clean Air Book to the most recent review by the leading world experts on this very problem. If Mr Davies would care to read the full report of the Lyon Conference on the Biological Effects of Asbestos, he will find it in the Annals of Occupational Hygiene (Ann. occup. Hyg. Vol. 16, pp 9-17, 1973) or the British Journal of Industrial Medicine (British. J. industr. Med. 1973, 30, 180-186). In the course of it he will find some reassurance on other points he has raised, particularly regarding the occurrence of asbestos fibres in beverages. The experts' view of this was that "such evidence as there is does not indicate any risk".

I mentioned in my earlier letter the work of the Asbestosis Research Council in seeking to establish more factual information concerning the extent of asbestos fibre in urban environments. Although Mr Davies refers to the work, he implies that the ARC has only recently accepted his contention that not enough work has yet been done to justify the opinion that

asbestos fibres in the urban air are not an environmental health hazard.

While the final results of very extensive surveys are at present awaiting publication, these and earlier investigations carried out by the ARC and other bodies repeatedly confirm that there is no evidence of an environmental health hazard as a result of urban pollution by asbestos. Mr Davies will be glad to know that continued extensive sampling by the ARC in other urban areas confirm the extremely low reading of less than 0.1  $\mu\text{g}$  per  $\text{m}^3$ , which was the basis of my original comment that in the U.K. measurements of the amount of asbestos in the general atmosphere were at least 1,000 times less than the acceptable occupational exposure for a working lifetime.

It should also be pointed out that mesotheliomas are not exclusively attributable to exposure to inhalation of asbestos. It is not surprising therefore that a significant percentage of the cases reported by the Pneumoconiosis Research Unit have had no direct contact with asbestos.

Yours faithfully,

A. A. CROSS

*The Asbestos Information Committee,  
Park Street,  
London.*

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## OBITUARY - Sir Gerald Nabarro

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It was with great regret that we learned of the death of Sir Gerald Nabarro, MP, on the 18th November, 1973.

Sir Gerald, who had been Conservative MP for South Worcestershire since 1966 and for Kidderminster from 1950-1964, and who was a very colourful back-bencher, will be remembered long by members of this Society for his conspicuous activities when as a back-bencher, he introduced the first Clean Air Bill in 1955. Sir Gerald worked very closely with the Society in the introduction of this Bill which was to implement the recommendations of the Beaver Committee's Report. He was backed by other Conservatives and by a number of Labour MPs including three former Ministers.

In the event, for financial and other reasons, it became

clear that this Bill would have to be a Government rather than a private member's measure. But it was not until the Government gave a firm promise of legislation that session that Sir Gerald agreed to withdraw his Bill. It is now a matter of history that the Government did sponsor the Bill and so this country was able to have the first Clean Air Act in the world on the Statute Book in 1956.

Although Sir Gerald Nabarro was well known in many circles, it is highly probable that he will be remembered most for the very major and important part he played in helping this country to lead the world in the realisation of clean air.

## Pollution Control in the Metal Industries

The Metals Society Act 1973 received the Royal Assent on 14th June, 1973. It merged the Iron and Steel Institute, founded in 1869, and the Institute of Metals, founded in 1908, into The Metals Society which becomes operational by 1st January, 1974, with its headquarters and library at 1 Carlton House Terrace, London SW1Y 5DB.

The Metals Society's primary object is to promote all aspects of the science and technology of all metals and alloys and allied materials. It will provide an international forum for discussion for those having an interest in metals, and a comprehensive publications service covering the Science, technology and use of metals and allied materials and the environment in which such metals are used.

It will publish some ten monthly, quarterly or half yearly journals for specialists, but all members will receive free copies of the monthly journal "Metals and Materials".

This will provide its readers with a comprehensive survey of industrial news and authoritative articles concerned with the environment of these industries on an international basis.

The National Society for Clean Air welcomes the inclusion of references to pollution control in the particular environment of the metal industry.

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## School children looking at the environment

About 1,000 youngsters from seventeen Redbridge Secondary Schools have been giving the Borough's Planning and Development Department a hand by studying their surroundings.

The Planners are starting on the very first stage of a Borough Plan which will set out policies and strategies for homes, shops, transport, roads, education, recreation, environment and other developments which affect living conditions. It will be a written document supported by maps and is to replace the twenty-year-old Initial Development Plan which was basically a land use zoning plan.

The children have carried out surveys of sample areas around their schools. Each area contained about 150 houses, and one or two shopping areas have been scrutinised as well.

They were asked to assess various aspects of the environment—open spaces, noise, pollution, traffic, parking—against criteria set out in the study and also to put down their own views about the environment.

## New support for Maplin and the Channel Tunnel

In a closely argued and powerful statement published on the 24th October, the Town and Country Planning Association comes down in favour of both the Maplin Airport project and the Channel Tunnel. The report studies the *interdependence* of the problems and opportunities created by the two projects together with the proposals for London's docklands and it lays down requirements at the national, regional and sub-regional levels which must be satisfied if these projects are to go ahead. The report calls for them to be 'deliberately planned and effectively organised as integral parts of a single sub-regional development scheme, with proper regard for their regional planning contexts'. The report recommends the preparation of a sectoral structure plan for the whole of the Thames-side sector of the London Metropolitan region; essential requirements for the redevelopment of docklands within that plan; a considerable extension of the designated area proposed for the 'New Town' making the outer edge of the Green Belt its western boundary; a single plan-making, co-ordinating and development agency for that area representing national and regional as well as local interests, with control over the location, scale and timing of development, with compulsory purchase powers of land based on its market value in actual existing use; and finally a new surface access corridor (corridor 'X') from the airport.

The report argues that 'the potential benefits of Maplin plus the Tunnel far outweigh the potential disbenefits' but only if certain requirements are satisfied:

- (i) national policy should be directed towards the development of regional airports . . .
- (ii) the Channel Tunnel should be regarded as a means . . . to extend British Rail's inter-city passenger, freightliner and motor-rail services to the regional capitals of Europe . . .
- (iii) . . . insofar as the airport, the dockland redevelopment, the Channel Tunnel terminals and all the associated road, rail and town developments will make for growth in the South East, their additional demands for capital investment must be met by a corresponding restriction on investment that would otherwise have taken place elsewhere in the South East.

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## Symposium on "The Persistence of Plumes"

The Institute of Fuel, South Coast Section, are organising a symposium on "The Persistence of Plumes" which will be held at The Canute Room, Polygon Hotel, Southampton, on 13th March, 1974. The object of this symposium will be to explore the topics of plume formation, stabilisation, effects and dispersal. The fee for attendance will be £2.00.

## **ODOUR AND FUME CONTROL**

A one day symposium is to be held on this subject on Tuesday 12th March 1974 at 14 Belgrave Square, London, S.W.1.

Eight papers will be presented on the measurement of odour control by absorption, wet scrubbing, filtration, thermal decomposition, catalytic and chemical oxidation as well as two papers on automotive exhaust emission control by filtration and catalytic devices. The Chairman will be Dr. F. H. H. Valentin, Deputy Director, Warren Spring Laboratory.

The symposium will start at 11.00 hours and close at 17.00 hours, a buffet lunch will be provided.

Pre-prints of the papers should be available in February 1974. Application for registration should be made to D. G. W. Frost, Development Manager, Johnson Matthey Chemicals Limited, Stockingswater Lane, Brimsdown, Enfield, Middlesex, EN3 7PW, accompanied by the appropriate fee of £7.00 for S.C.I. members, £9.00 for non-members and £3.00 for students.

*Applications should be received by 1st March 1974.*

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## ***Technical Problems of Air Pollution***

A two day symposium on Technical Problems of Air Pollution will be held at the Brockington Extension Lecture Theatre, Loughborough University on the 7th and 8th January, 1974.

Among the speakers will be Professor E. J. Richards, Vice-Chancellor, Loughborough University of Technology, Dr. J. S. S. Reay, Head, Air Pollution Division, Warren Spring Laboratory, Sir Frederick Warner, Cremer & Warner, Consulting Chemical Engineers and Professor C. J. Stairmand.

The Opening Address will be given by the Director of the Society, Rear Admiral P. G. Sharp.

Further information may be obtained from: Professor D. C. Freshwater, Department of Chemical Engineering, University of Technology, Loughborough, Leicestershire, LE11 3TU.

## E.P.E.M.A.

The Environmental Protection Equipment Manufacturers' Association was inaugurated at a meeting held in September 1972 under the auspices of the Society. The then President of the Society Mr Stanley E. Cohen, C.B.E., C.C., F.R.S.A., took the Chair at this meeting and he was supported, amongst others, by Sir John Charrington, a former President of the Society and Mr Stanley Cayton, M.B.E., the Chairman of the Council.

For some considerable time it had been felt by some members of the Society and by manufacturers of equipment for the abatement of pollution that there should be some form of association of such manufacturers which could represent their views and have close links with the Society. For some two years before the inaugural meeting negotiations and talks had been going on, and in September 1972 it was felt that the time was ripe for a definite start to be made. Accordingly, the meeting was held and the Association launched; and in the last twelve months with administrative help from the Society, it is now beginning to grow and has some twelve members.

E.P.E.M.A. is a non-profit making Association of manufacturers of equipment designed to reduce and/or monitor pollution emitted to the environment. The Association is financed entirely by subscriptions from its members. One of the main aims of the Association is, through its members, to seek to improve the standards of all

equipment for the abatement and monitoring of pollution. To enable it to do this, the Association seeks to be able to negotiate with appropriate Government departments and to establish attainable and maintainable standards for such equipment and to ensure that members of the Association manufacture, market and install equipment to such standards. In other words, the Association is endeavouring to provide protection for the consumer. In addition, the Association will provide an advisory service to customers regarding supply, provision, installation and operation of suitable pollution control and measuring or monitoring equipment. Obviously, however, it will not act for such customers in a consultant capacity.

E.P.E.M.A. is a member of the National Society for Clean Air; it is recognised as a national body and has a representative, its Chairman, Mr Max Beaumont, as a member of the Society's Council. The Association is also represented on the Society's Technical Committee. E.P.E.M.A., which is now expanding its membership is in a position to advise customers regarding equipment for the control and monitoring of pollution. Further information may be obtained from E.P.E.M.A. care of 136 North Street, Brighton BN1 1RG. It is hoped that all members of the Society will support E.P.E.M.A. in its work and make use of the services which it offers.

## E.P.E.M.A.

### THE ENVIRONMENTAL PROTECTION EQUIPMENT MANUFACTURERS ASSOCIATION

An Association of manufacturers of equipment for the control and monitoring of pollution.

Its aims are to improve the standards of the equipment supplied by its members and to provide an advisory service to customers.

E.P.E.M.A. is a corporate member of the National Society for Clean Air and is represented on the Council of the Society.

Further information—for prospective members as well as prospective customers—from

**E.P.E.M.A.,  
136, North Street,  
Brighton,  
BN1 1RG.**

Tel: Brighton 26313

Secretary: K. S. Dunn, C.Eng.,  
A.M.Inst.F.

# INDUSTRIAL NEWS

## Travelling Scholarship to Study Air Pollution

A travelling scholarship to enable a public health inspector to study air pollution, particularly from sulphur dioxide, is being offered by Conoco Limited in conjunction with the Association of Public Health Inspectors.

The scholarship is worth £500 and will be awarded to the Fellow or Member of the APHI who submits the best proposed study tour.

There is no restriction on the distance that may be travelled by the successful candidate but the selection panel will ensure that the tour is practicable with reference to the cost and time needed to complete it.

It is expected that the period of the tour will be approximately three weeks, which must be taken during April/May 1974.

On his return the candidate will be required to prepare a detailed report on his tour and submit it to the APHI by 31st July 1974.

Conoco is offering the scholarship to promote more intensive research into the much publicised but little known effects on health of sulphur dioxide pollution.

Reader Enquiry Service No. 73104

## University Receives Pollution Research Grant

Two research projects into the effects on plant growth of sulphur dioxide ( $\text{SO}_2$ ) in the atmosphere have been set up by the Department of Physiology and Environmental Studies at the University of Nottingham's School of Agriculture.

The research has been made possible by a grant of over £1,200 from Conoco Limited to enable the University to buy the sensitive measurement equipment required by both projects.

The first project will use infra red gas analysis of carbon dioxide to investigate the effects of  $\text{SO}_2$  on photosynthesis rates over time periods

ranging from a few minutes to, perhaps a day. This it is hoped should throw light on the mechanisms by which  $\text{SO}_2$  affects growth and yield.

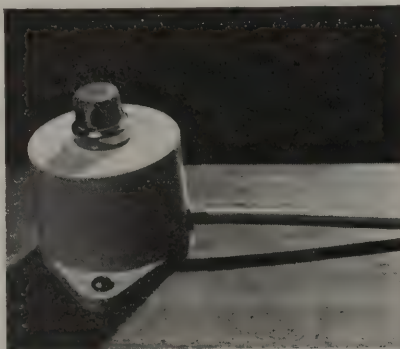
Project number two will investigate effects of  $\text{SO}_2$  on growth and development of plants over periods of one to three weeks. It aims to identify the particular stages of growth that are susceptible and may lead to a better understanding of any limitations which present  $\text{SO}_2$  emission policies may have on crop production.

Two undergraduates studying for B.Sc. Hons. Agricultural Science, Mr. R. C. Watson and Mr. G. C. Freeston, will undertake the research, part of which will form their final year projects. Joint project supervisors are Dr. P. V. Biscoe, University Research Fellow and Dr. M. H. Unsworth, Lecturer, Environmental Physics.

Reader Enquiry Service No. 73105

## Radiatron's Solid-State 'Nose' Sniffs out Dangerous Gases

The detection and warning of minute traces of poisonous or inflammable gases in the atmosphere is now possible using a unique low-cost and highly sensitive solid-state 'nose' device now available in the U.K. from Radiatron Limited, Twickenham.



Radiatron's 'nose' ensures that dangerous or unpleasant atmospheres can be detected in sufficient time to allow safety measures to be initiated, by 'triggering' visual or audible warning systems, or by activating air-conditioning, fire control, and other hazard prevention systems.

The device is small enough to be incorporated in a miners' helmet. It is cheap enough to install as a

cigarette smoking detector in school lavatories, or in conference rooms, other meeting places and many types of industrial and marine hazard areas.

Called the ES-11, Radiatron's new pollution detector is a small lightweight and highly stable semiconductor device which senses minute concentrations—a few parts per million—of all reducing and inflammable gases, e.g. hydrogen, carbon monoxide, methane, propane, butane, acetylene and sulphur dioxide. It will also react to smoke-laden and carboniferous atmospheres. The accuracy of measurement is unaffected by moisture in the atmosphere or by slow variations in temperatures.

Reader Enquiry Service No. 73106

## NIFES Ltd.

The National Industrial Fuel Efficiency Service Ltd., taken over from the Government by its employees, has made a profit for the first time in its first year of operation as a private company. This switch from accumulated losses over a period of nearly 20 years was reported at the first annual general meeting of the company at Altrincham, Cheshire, on 18th August 1973.

NIFES, an engineering consultancy specialising in the conservation and efficient use of fuel and power, was set up by the Government as a non-profit making company in 1953. It has developed into the largest organisation of its kind in the world. Apart from its main objective of utilising fuel and power at maximum efficiency, the company is also concerned with pollution and environmental problems.

When the Government decided to hive-off NIFES under its economic policy, the Department of Trade and Industry, the responsible authority, agreed to amended articles of association so that NIFES could be bought by its employees. Well over half the total number of employees combined to subscribe the £23,000 issued share capital.

The new board's statement and review to the shareholders refers briefly to the world fuel shortage and em-

phases the increasing importance of NIFES in combating the threatened crisis which is developing on a global scale.

"The approaching energy crisis must lead to further sharp increases in energy costs which can only be combated by active conservation in which the company has always been pre-eminent and is now the largest organisation of this kind in the world.

"In 1969 an independent survey of the results achieved by our advisory and testing services showed that in a 15-year period the total energy savings were at least 20 million tons of coal equivalent. In most cases these are continuing savings, and including the hundreds of further surveys the savings now approach 30 million tons."

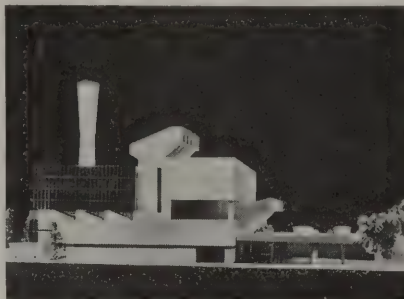
### European Collaboration in Fusion Research

A contract has been signed between the European Atomic Energy Community (Euratom) and the United Kingdom Atomic Energy Authority to advance collaboration in research into controlled nuclear fusion and plasma physics. Similar contracts have been in operation for several years in France, Italy, Germany, the Netherlands and Belgium. The contract takes effect from 1st January 1974. It integrates the Authority's fusion programme into an existing co-ordinated five-year Community programme which has covered fusion research in the Six since 1971. This programme runs until the end of 1975 and a further five-year programme to follow on immediately is currently under consideration in Brussels.

The aim of these programmes is to attain in due course Community construction of large experimental installations and, subsequently, prototype fusion reactors for the generation of electrical power with a view to their industrial application and marketing. The signing of the contract was envisaged when an increase in the U.K. fusion programme at the Authority's Culham Laboratory was announced by the Minister for Industry on 22nd March 1973. Under the terms of the contract, Euratom will pay approximately one quarter of the cost of the British research, which totals £17 million over the three years, with additional contributions for the more important experiments. A similar Contract of Association is being signed between Euratom and the Danish Atomic Energy Commission.

### Allen West to Help Keep Coventry Rubbish Free

The City of Coventry are making a determined bid to tackle the growing problem of city refuse in a pollution-free way.



Early next year, a new £3½ million Waste Reduction Unit will begin operating at Whitley, three-quarters of a mile from the city centre. In a city famed for its cathedral and Lady Godiva, not even refuse is being allowed to defeat aesthetics, and the new building will be visually attractive. It will also mean that, for Coventry, unsightly refuse tips are out.

Head Wrightson Process Engineering Limited, the Teesside incineration experts who are supplying the main plant installation, and W. C. Holmes and Company Limited of Huddersfield, who are providing the gas cleaning electrostatic precipitator, have chosen Allen West motor control gear following their experience with another large incineration plant at Nottingham, where two Allen West 'Concept 75' motor control centres are installed. The Coventry plant will have many main motors of various powers between 0.5 and 75 hp driving everything from boiler feed pumps to furnace reciprocating grates. The six Allen West 'Unitactor VA' grouped starter boards, one for each of the three incinerators, one for the residue-handling system, and one for the precipitator dust and draught system, are nearing completion.

Refuse now has to be taken ever greater distances from cities for conventional disposal, and at the same time wages and other costs continue to rise. In some parts of the U.K., the costs of waste collection and disposal have risen by 300 per cent in the last 18 months. The new Waste Reduction Unit at Coventry, with its high efficiency and convenient location, will help stabilize costs as well as preserve the environment. Allen West will be making a useful contribution to the operation of this unit and that at Nottingham well into the 1980s.

Reader Enquiry Service No. 73107

### For Flow Visualisation in Air

A new Smoke Generator System, designed in the National Physical Laboratories at Teddington, is now being manufactured under licence by T.E.M. Engineering Limited of Crawley.

Originally developed for Aerodynamics Research in Wind Tunnels, this equipment has potential applications wherever air-flows have to be made visible in the range up to about 46 m/s (150 ft/s).

The heart of the system is a novel Smoke Probe, which, in its standard form, has a hook-like shape approximately 360 mm (14 in) long. A vaporiser element is located in the tip, and oil and electrical feeds are provided within the slender steel stem. When paraffin or 'Ondina' oil is pumped through this probe, a persistent narrow smoke plume with distinct boundaries is formed. At maximum rated air speeds this plume remains clearly defined, although somewhat broader, at least 4m (13 ft) downstream.

Known or potential applications include R & D and Testing for Aerodynamics (Aeronautical, Vehicular, Industrial, Building, Civil Engineering and Environmental), Air Conditioning, Ventilation, Air Cooling Systems for Plant and Equipment, the Distribution and Mixing of Non-Combustible Gases in large pipes and vessels, and Fume Extraction. It is an ideal teaching aid.

Reader Enquiry Service No. 73108

### NSF Funds Second Year of Solar Energy Study

The National Science Foundation has awarded \$494,700 in additional funds to a University of Minnesota/Honeywell team of scientists for a second year of studies on the feasibility of converting solar energy to run a central power station.

"In our first year, we made substantial advances in determining the materials we will use for heat storage, reflective surfaces and the heat pipe," comments Mr. Roger Schmidt, Honeywell programme manager. "The new funds will enable us to push forward toward the goal of capturing energy from the sun—a relatively unused but unlimited non-polluting alternate source of energy."

The project involves determining the best way to reflect solar energy off trough-like surfaces on to a heat pipe which would convert the energy to steam.

The second year of the study will involve building a working scale model collector 4 ft diameter and 15 ft long. The actual collector, if built, would be 10 ft diameter and 40 ft long.

A computer will compile data gathered from the working model, and analysis of this information will help determine the cost of converting solar energy to generate electricity from a central power station.

Honeywell scientists say a pilot power plant could be operating in the southwestern U.S. by 1990.

#### **The British Battery Industry**

Haddon-Oldham Ltd. have produced a small publication on The British Battery Industry—And Europe. Although battery manufacture in Great Britain is something like a century old, the British battery industry is currently undergoing a period of expansion both at home and internationally, particularly in Europe and this publication is an appraisal of the situation.

#### **National Smokeless Fuels Ltd. Marketing Director Appointed**

The National Coal Board, through their holding company NCB (Coal Products) Ltd., have appointed Mr. L. V. Penzer Marketing Director of

National Smokeless Fuels Ltd., the company responsible for the production of their manufactured domestic smokeless fuels.

Mr. Penzer was formerly Deputy Regional Marketing Director of the Board's Northern Sales Region.

#### **Peabody Scrubbers at English China Clays**

The photograph shows four large Peabody Scrubber Assemblies installed for English China Clays at their Par Works in Cornwall. These scrubbers not only cool and clean the hot sulphurous clay dryer exhaust gases, but have an important secondary function of heating up the clay liquor used as the scrubbing media.

Each scrubber on this site has a capacity of 50,000 cfm of dry gases, and is fabricated throughout in AISI 316 steel. The scrubber diameters are 11 ft and the self supporting exhaust stacks discharge 150 ft above ground. Dust removal efficiencies of 99.5 per cent are achieved using the single impingement tray plus single venturi slot tray configuration developed by Peabody for this particular application.



English Clays have standardised on Peabody equipment for this important product and heat recovery operation, and over the last 15 years some 60 Peabody scrubbers have been installed for the company.

Reader Enquiry Service No. 73109

# CLEAN AIR

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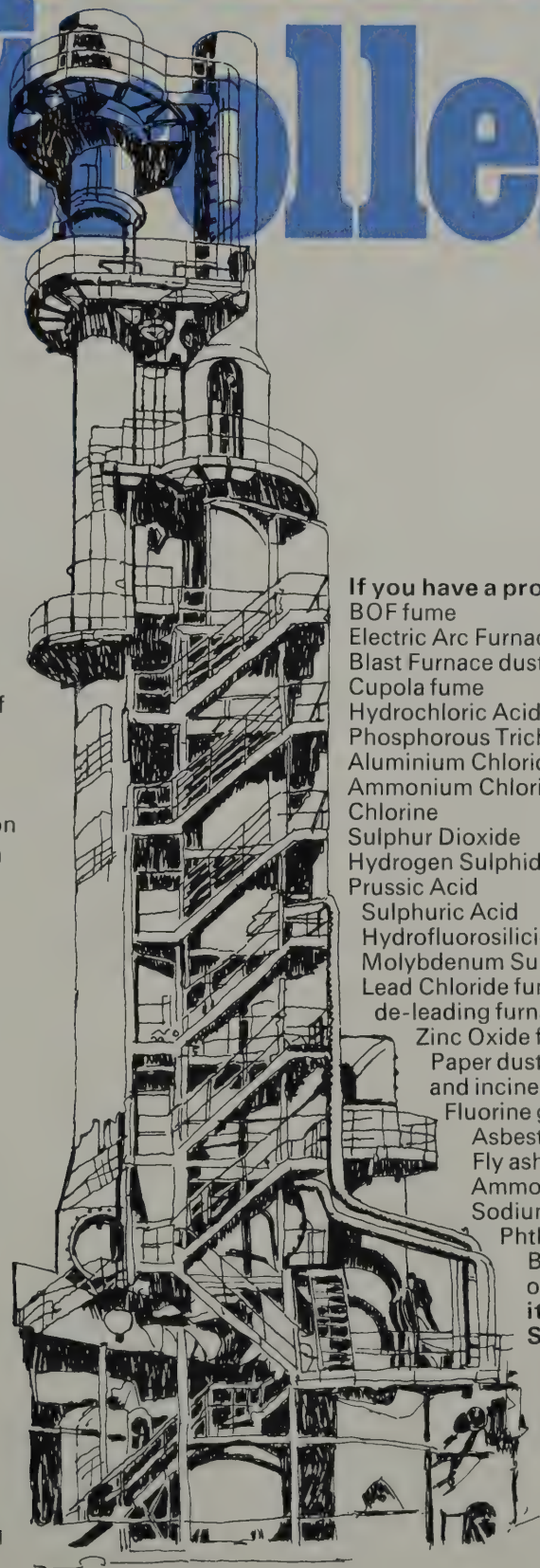
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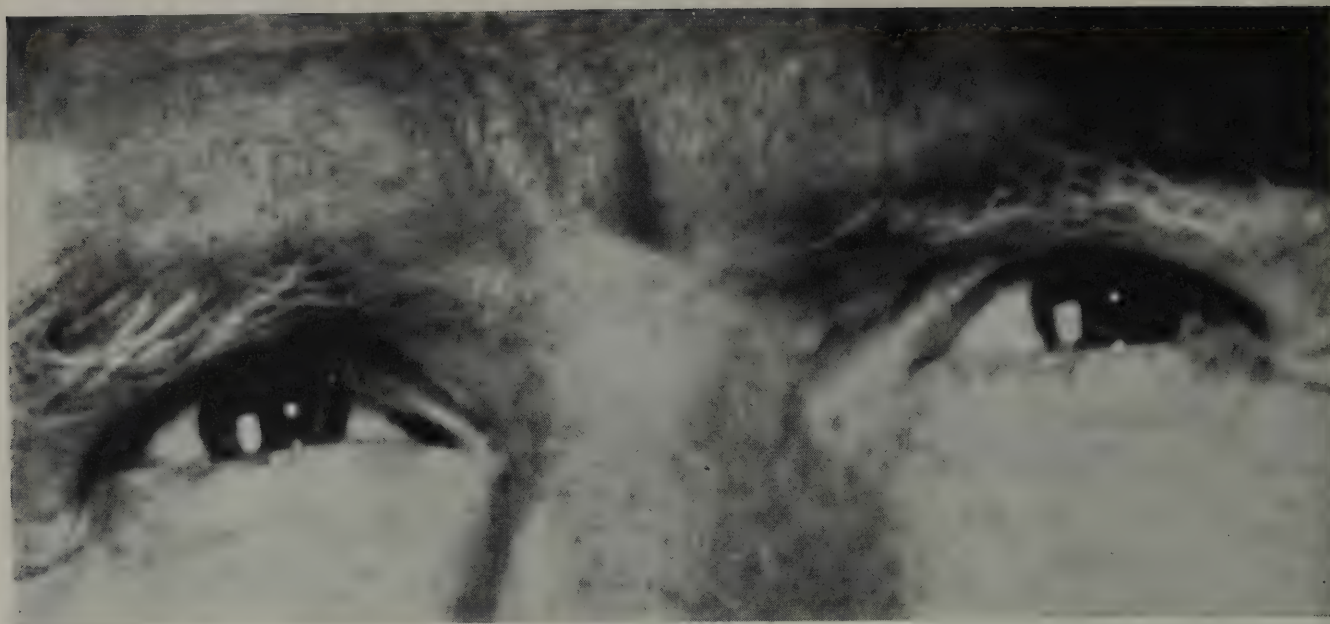
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**SPRING 1974**

**VOL. 4 NO. 13**

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# CLEAN AIR

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Vol. 4   No. 13

Spring 1974

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# CLEAN AIR

## Energy and the Environment

Many people, including most members of this Society, have been aware for some time that the supplies of fossil fuels are finite and that the world was approaching an energy problem. Indeed, long before the Arab-Israeli war of October 1973 some people were talking of an energy "crisis" while those in the fuel industries were talking of a "problem". Indeed, at the Clean Air Conference at Torquay, the Society's President, Mr. H. B. Greenborough, developed this theme as his Presidential Address. As Mr. Greenborough is one of the leading figures of the oil industry in this country, it was only natural that he should deal with the problem as seen by the oil industry. From the same platform, Mr. Donald Davies of the National Coal Board, in his Opening Address, showed how coal as a source of energy was about to enter upon a new era.

Mr. Greenborough made it clear that he was discussing the problem without knowing what would be the effects of the Arab-Israeli war. But it was even then clear that much of the problem connected with oil would be one of price.

At the time of writing, the United Kingdom is subsisting on reduced supplies of oil at a greatly increased price, and we know that whether we like it or not, we are going to have to pay the price. The new era for coal, far from getting off to a good start while oil is discomfited, is severely hampered by the miner's work to rule and the threat of a nationwide strike. So the energy crisis has really arrived; not because the supplies of fossil fuels have run out as was originally forecast, but because of man's own action in political and economic fields. Suddenly, everyone, wherever they may be, whether in the home, in the office, in the factory, in the street, is aware of how much energy we use and how dependent upon it we all are. We are being enjoined to save energy, to switch off lights, to do without heating and indeed in many cases to work for only three days a week. Energy is short and is therefore rationed; and none of us like it. We talk of how we can save energy and this is nothing new, for there was similar talk when we faced similar difficulties in the past. But once the situation righted itself, once more we reverted to old habits and were prodigal in our use of energy.

However, this time it does seem that people are more aware of the underlying problem; and so perhaps this time we really might learn to use our energy properly.

This Society has long advocated a fuel or energy policy, a policy which seeks to use the fuels available in the best possible way. But in the past, the only fuel policy that this country has had has been one whereby all the fuel industries were allowed to compete with each other, especially in the domestic market. Whether we shall now achieve a fuel policy which will seek to make the best use of the fuels available to us remains to be seen, but at any rate we now have a Secretary of State for Energy and it is to be hoped that in the future we will have such a policy.

Somewhat naturally, the concern of a Society such as this is bound up with the effects of any energy policy on clean air and the environment. Already we have seen how in America environmental standards have been reduced because of the energy problem. In this country, the expected reductions in the amounts of lead in petrol have been deferred and some smoke control orders have been suspended because of a lack of smokeless fuels. To a degree, such things are inevitable. But if we are not careful, we could put the clock back and undo much that has taken years to achieve. If we are to use more coal, which we almost certainly must, then we must use this in a proper manner and not waste it in open domestic fireplaces. We must use oil where no other fuel will serve, for example in transport. Gas should be the fuel used where it is essential that pollution is kept to the absolute minimum. But although this may be using fuel in what many people would consider to be a logical manner, it is not necessarily saving energy.

To conserve energy and to save fuel means that we must extract the utmost energy from what fuel we have. There is too much waste heat in this country. Heat which could be producing energy is heating estuaries and rivers; it is causing heat islands in our towns near large power stations and when we incinerate rubbish as a means of disposal, the energy released goes up the chimney. It is here where we can probably make the greatest strides. It is true that we have district heating schemes, but these are not anything like enough. Such schemes are common in Scandinavia and in other parts of the Continent. In this country we have tended to say "it is too difficult". It is not too

difficult but it does require a new approach to the whole concept. Where waste heat is generated by power stations and large incinerators, it should be used. We must learn that it is no more difficult to connect a dwelling to a heat source than to connect it to a supply of gas or electricity, or indeed to television. Such conservation of our energy will, in its turn, help to keep air pollution to a minimum and will do much to rid us of thermal pollution.

But in considering what we must do to ensure that the environment is unharmed, it is important that we define what we mean by "environment". To some this is an unspoilt view out of their country cottage window. To many more it may be the ability to live in a warm house or flat provided with sufficient light and to be able to walk in city streets that are adequately lit. The one does not want a new power station or coal mine spoiling his view. The other is seeking warmth and light and probably does not worry very much how they come or where they come from. To maintain the balance between the two is the work of the true environmentalist and the true conservationist. It may not be necessary to spoil the view by building a power station if the energy which that power station would produce is obtainable elsewhere: and it probably is—from the saving of waste heat.

The Society is in a position to give a lead in this field of conservation of energy. In so doing it will not only be maintaining its past traditions, but also showing that after 75 years there are still new tasks to be taken in hand, tasks which are important and beneficial to the community as a whole.

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20.30 The Conference will be opened by Mr. David Gibson-Watt, M.C., M.P. The President will deliver the annual address.

#### Session Two—Tuesday 16th October

a.m. New Legislation (The Local Government Act, The Protection of the Environment Bill, The Water Act, 1973, etc.) and its implications and effects on Local Authorities, Regional Water Authorities, etc. W. Bate, M.B.E. (*Chief Public Health Inspector, Cardiff*)

#### Session Three—Tuesday 16th October

p.m. Environmental Pollution: The Technical Aspects of Co-operation between Industry and the Local Authority—Dr. Roland Jenkins (*B.P. Chemicals International Ltd., Port Talbot*)

#### Session Four—Wednesday 16th October

a.m. Environmental Pollution: Road Traffic  
 (a) Noise—T. W. Heppell (*Building Research Establishment, D.O.E.*)  
 (b) Preliminary Findings of the Five Towns Survey—Dr. R. G. Derwent and Dr. H. N. Stewart (*Warren Spring Laboratory, D.T.I.*)

#### Session Five—Thursday 17th October

a.m. The Prevention of Pollution from Industry  
 (a) The Coal Industry—Mr. David Broadbent (*National Coal Board*)  
 (b) The Steel Industry—Dr. A. O'Connor (*British Steel Corporation*)

#### Open Session—Thursday 17th October

p.m. Wild Life and the Effects of Pollution—Dr. K. Mellanby, C.B.E. (*National Environment Research Council, Monks Wood Experimental Station*)

#### Session Seven—Friday 18th October

a.m. The Measurement of Heavy Metals in the Atmosphere and their Interpretation  
 (a) Mr. N. J. Pattenden (*A.E.R.E., Harwell*)  
 (b) Prof. G. T. Goodman, Dr. G. D. Parry, Mr. S. Smith and Mr. M. J. Inskip (*Chelsea College, University of London*)

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# The Open University

## Environmental Control and Public Health

by  
J. R. Tagg

Future historians will no doubt record 1973 as the year when the western nations at last faced the reality of the world's limited energy resources. In retrospect we may all come to value the timely warning of the oil sheiks. Our daily lives can never be the same again.

Recent years have seen a growing awareness of the inroads which we—as part of a modern energy-intensive industrial society—were making into our natural resources. But for most of us, it was a problem which we put aside for someone else to solve. Our oil supplies may be restored in part, but they will be priced at a level which should stimulate a reappraisal by everyone of the way in which we arrange for their exploitation and use.

There will be a movement to revert to short-sighted practices which were abandoned earlier on environmental grounds. Shortages and high costs throughout our economy will be put forward as justification. In America, moves to relax air quality standards and allow power stations to burn high-sulphur coal was an immediate and typical response. So too was the rapid removal of obstacles to the construction of the Trans Alaska Pipeline and the proposal to relax environmental criteria applied to the strip mining of coal.

It is in the context of such pressures that in 1975 the Open University is to launch a new course on Environmental Control and Public Health. Today, concern for the environment is widespread. But if this concern is to be no more than a fashionable pose, to be cast aside when other problems appeal, we need to understand more fully both the impact of our demands on the environment and how we can minimise their harmful effects.

The new course will be concerned with the management of natural resources such as water and air, and with the problems of refuse and waste disposal, where recycling could save valuable materials and contribute to our energy supplies. It will also cover noise, a feature of increasing disturbance to us all.

The availability of pure water, clean air, the disposal of refuse and sewage, the noise we create and the public health problems which stem from them are major environmental factors influencing the development and growth of modern civilised life.

Each of these factors and their inter-relationships will be studied in turn. The course will trace the growth of our concern with public health and show how this stimulated the enactment of appropriate control. In mounting this course, the primary concern of the Open University is to show how, within the governing legislation, we may most effectively manage these environmental factors for the common good.

It has been designed both for those with a professional interest in the environment, and for laymen who are concerned with environmental issues. It will enable planners, public health inspectors, sewage plant managers and others with executive functions in this area, to place their work in a broader framework and to achieve a greater understanding of the interaction of environmental factors. (Local government reorganisation has created many new posts which will call for exactly this type of approach.) It will benefit the layman who wishes to add his voice to the current debate on the proper ordering and use of environmental resources.

This is an interdisciplinary course covering the following topics: public health, water resource management, the disposal of toxic and solid wastes, air pollution and noise. People wishing to take it need no qualifications to apply. Some knowledge of chemistry would be useful but not essential. A glossary covering terms in chemistry, biology, maths and physics will be available as supporting material. Those with basic numeracy and the ability to read a graph should be able to follow and benefit from taking the course.

The central core of the course is contained in a series of correspondence texts specially produced by the University. Students will receive 16 of these units over a period of 32 weeks. Each text will be about 14,000 to 16,000 words in length and should require between 10 and 12 hours' work. Appropriate home experiments will be integrated with the teaching material and there will also be associated radio and television programmes.

The first unit contains an introduction to the main themes of the course, and describes the way the following units interrelate. There will then be a unit on public health, which examines the development of the public health services in Britain since the early nineteenth century. The text will show how the resulting improvements in community health can be assessed and how areas for further improvement can be identified.

Six units will cover the field of water resource management. The supply, treatment, distribution and consumption of water will be reviewed in some detail with emphasis placed on the need for conservation because of increasing demand. The study of water borne wastes will follow naturally with an account of the collection and treatment of sewage to show how water may be returned safely to the natural cycle for reuse. The legislative and administrative control of water use is now subject to rapid change. The student will be made aware of the current situation and proposed changes by a clear and concise summary.

The two units which follow will cover the safe and economic removal of toxic and solid wastes together with an account of municipal refuse disposal and related legislation. Here emphasis will be placed on the need for waste re-cycling to conserve potentially scarce resources and there will be an account of new procedures which could contribute to our deteriorating supplies of energy.

Three further units will examine air pollution, a subject of obvious interest to readers of this journal. The text will be structured to show how air pollutants are produced, why they are emitted into the air and how they are subsequently rendered harmless by dilution, dispersal and change. By surveying the nature of their damaging effects on the atmosphere, on materials, vegetation and on man himself, the student will be able to balance the social cost of air pollution damage against the cost of its alleviation. This part of the course will be supported by a detailed case study of air pollution control. We hope readers will mention this course when next they are asked to explain some air pollution problems.

Two more units will cover noise, a universal and unwelcome intrusion into our society. They will review its effects and show how measurement and legislation are interrelated in progress towards its satisfactory control.

One final text rounds off the written material. It will pay special attention to a number of environmental features which, in the future, are likely to be of increasing concern to us all.

"Public Health and Environmental Control" is part of the Open University's programme of post-experience courses for 1975. This programme is offered separately from the University's undergraduate programme for people who wish to update or extend the knowledge of their field or gain an understanding of other subjects relevant to their work.

Post-experience students take their courses in the same way as undergraduate students using the Open University's multi-media teaching system. All courses are designed for part-time study, with the student doing most of his Open University work at home. The texts or units, which are sent direct by post, guide him through the course week by week. The texts are linked to radio and television programmes on VHF Radio 3 and 4 and BBC 2 television. Course work includes the preparation of assignments which are graded with constructive comment by tutors.

The Public Health and Environmental Control course includes a home experiment kit which is sent to all students. This is planned to include a dissolved oxygen meter, a comparator, air pollution sampling apparatus and a sound level indicator. The kit is designed to allow the student to measure aspects of water, air and noise pollution and to test the concepts of the course in a practical manner.

The water pollution and water quality experiments are based on the dissolved oxygen meter and a comparator which enables levels of ammonia and chlorides to be determined, indicating the degree of organic pollution. An understanding of air quality criteria is provided by the air pollution sampling apparatus. The sound level indicator has a set of associated traffic noise measurement experiments. A slide viewer with slides will also be incorporated so that the student will have examples of airborne damage to plant life, and the relationship between water life and the degree and type of pollution. The effects of selected aspects of pollution on health will also be shown, for example, a lung section damaged by air pollution and the effects of excessive noise on the hearing system.

The course will run for 32 weeks from February to November 1975. The application period will open in May 1974.

The course is being prepared under the chairmanship of Dr. A. Porteous, Reader in Engineering Mechanics at the Open University, and many of the units are being written by outside consultants. The six units on water resource management are being prepared by a firm of consulting engineers which has undertaken the design of many types of civil engineering schemes including those for public water supply, sewerage, sewage disposal, drainage and irrigation.

The units on air pollution are being prepared by Mr. J. R. Tagg, formerly of the Electrical Research Association, and now a member of the Open University staff, and the case study is being written by Dr. J. Kroon, a Dutch expert in the field. The units on noise are the responsibility of Dr. K. Attenborough of the Open University. Dr. M. Clifton of the University of Nottingham is covering the medical aspects. Many readers will remember her able management of the National Survey of Air Pollution.

The student's progress through the course will be assessed in two ways. Conventional written assignments will be marked by tutors, but the student will also use a special assignment form which is assessed automatically by the University's own computer. It is hoped to incorporate feedback from the assignment monitoring in 8 of the 16 radio programmes.

At the end of the course there will be an optional examination. Students who are successful both in continuous assessment and in the examination will receive a course certificate. If the student wishes to continue his studies this certificate will count as a half credit towards an Open University BA degree for which a total of 6 credits is required.

The Open University's post-experience courses prospectus together with application forms are available from the Post-experience Student Office, The Open University, PO Box 76, Milton Keynes, MK7 6AN.

## POLLUTION — WHO PAYS

A course for sixth-form students, entitled "Pollution—Who Pays", is being held on 24th/25th April 1974 at Peak National Park Study Centre.

The fee for the course is £4.20 and further details are available from Peak National Park Study Centre, Losehill Hall, Castleton, Sheffield, S30 2WB.

# AIR POLLUTION ABSTRACTS

**1311 Trace Metal Pollution in the Environment**, Robert E. Lee, Jr. and Derryl J. von Lehmden. *Journal of the APCA*, October 1973. Trace metals introduced to the environment from fuel combustion, incineration and industrial emission sources are causing increasing concern to air pollution researchers. Several metals in urban air, including lead and vanadium, are associated with particles in the predominantly submicrometer diameter range thereby presenting an inhalation threat. There is also growing evidence that some metals emitted from stationary sources are concentrated in submicrometer sized particles which may pass through emission control devices. This report summarizes the concentration and size of trace metals in urban air, the concentration ranges found in selected fuels and emission sources and describes the areas where further studies are needed.

**1312 Outdoor-Indoor Levels of Six Air Pollutants**, C. R. Thompson, Earl G. Hensel and Gerrit Kats. *Journal of the APCA*, October 1973. Comparisons were made of the levels of six air pollutants—total oxidant, peroxyacetyl nitrate (PAN), nitric oxide, nitrogen dioxide, carbon monoxide and particulate matter—outside and inside 11 buildings in the South Coast Basin of California during summer and autumn. Total oxidant levels inside depend upon how much outside air is being brought in and the residence time in the structure. With rapid intake and circulation, levels inside may be two-thirds those outside.

With little intake and slow circulation, amounts inside decay to near zero. PAN is more persistent in buildings because it is more stable than ozone but also decays to low levels over an extended period. Oxides of nitrogen and CO are much more stable than oxidant or PAN and when carried into buildings remain until diluted or exhausted. Particulate matter levels indoors depend largely upon velocity of air movement. Indoor areas where foot traffic was light or which had low ventilation rates had reduced amounts of particulates. Electrostatic precipitators were much more effective than coarse primary filters used in many buildings for removing particulate matter.

**1313 The Operational Forecasting of Undesirable Pollution Levels Based on a Combined Pollution Index.**

H. G. McAdie and D. K. A. Gillies. *Journal of the APCA*, November 1973. Several air pollution indices have been developed for control action and public information. The majority of these are based on some combination of SO<sub>2</sub> and particulate matter levels, since epidemiological studies indicate a relationship between severity of health effects and these constituents. The present paper describes the application of one such index, in conjunction with synoptic meteorological forecasting, to an optional programme for forecasting pollution potential in the Sarnia, Ontario, petrochemical complex. The programme was developed in conjunction with the Lambton Industrial Society. This system has operated for over 5

years with approximately 70% accuracy of predicting adverse situations. The performance of this programme indicates that meteorological forecasts can be used successfully to provide major sources with the advance information necessary to effect any additional control measures relevant to their individual operations.

**1314 Air Quality Standards National and International, Saburo Yanagisawa.**

*Journal of the APCA*, November 1973. The advantages and disadvantages of establishing worldwide air quality standards are reviewed. International standards would represent the best and most advanced procedures and might lead to improvement in standards in some countries where air quality is far from adequate. International standards also would permit accurate comparisons of air pollution among countries and would provide a sound basis for combating pollution.

**1315 Control of Environmental Noise.**

Paul Jensen. *Journal of the APCA*, December 1973. The article reviews the current state of knowledge of noise and how people respond to noise. Sources of community noise are discussed and existing federal legislation pertaining to noise is mentioned. Methods of reducing the noise impact on communities from aircraft, surface transportation and industrial sites are presented. Interior noise in industry, OSHA noise standards and means of controlling the noise to minimize hearing impairment are emphasized.

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## THE INSTITUTE FOR FISCAL STUDIES

The Institute for Fiscal Studies is holding a conference—"Fiscal Policy and the Environment"—on the 3rd May at the Conference Centre, 82 Cavendish Street, London W1.

The conference, chaired by Professor Kenneth Mellanby, will be divided into two sessions—'Control of Pollution' during the morning and 'Resource Management' during the afternoon. Speakers will include Mrs. Judith Marquand, Dr. Norman Lee, Mr. R. A. L. Davies, Mr. Richard Lecomber, Pro. Richard Scorer, and Mr. David Pearce.

For further information apply, by 24th April, to: The Institute for Fiscal Studies, 1 Bell Yard, London WC2A 2JX. Telephone: 01-405 2378.

# SMOKE CONTROL AREAS

## Progress Report

Position at 31st December 1973

(Figures supplied by the Department of the Environment, The Welsh Office, The Northern Ireland Ministry of Development and the Scottish Development Department.

	England			Wales		Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 30.9.73</b>	4,201	1,283,527		14	1,961	222	202,416		56	13,987	
<i>Acres</i> .. .. .			5,928,117		7,102		517,696			32,956	
<i>Premises</i> .. .. .											
<b>Smoke Control Orders Confirmed (30.9.73-31.12.73)</b>	64	22,168		5	894	2	1,049		2	120	
<i>Acres</i> .. .. .			74,852		3,397		2,454			1,500	
<i>Premises</i> .. .. .											
<b>Totals</b> .. .. .	<b>4,265</b>	<b>1,305,695</b>	<b>6,002,969</b>	<b>19</b>	<b>2,855</b>	<b>224</b>	<b>203,465</b>	<b>520,150</b>	<b>58</b>	<b>14,107</b>	<b>34,456</b>
<b>Smoke Control Orders Submitted (30.9.73-31.12.73)</b>	63	31,382		—	—	—	—		—	—	
<i>Acres</i> .. .. .			100,110		—		—			—	
<i>Premises</i> .. .. .											
<b>Grand Totals</b> .. .. .	<b>4,328</b>	<b>1,337,077</b>	<b>6,103,079</b>	<b>19</b>	<b>2,855</b>	<b>224</b>	<b>203,465</b>	<b>520,150</b>	<b>58</b>	<b>14,107</b>	<b>34,456</b>
<b>Smokeless Zones (Local Acts) in operation</b> .. .. .	44	3,400		—	—	—	—		—	—	
<i>Acres</i> .. .. .			41,060		—		—			—	
<i>Premises</i> .. .. .											

## SMOKE CONTROL POSITION IN REGIONS OF ENGLAND

at 31st December 1973

(Figures supplied by the Department of the Environment)

(1) <i>Region</i>	(2) <i>No. of black area acres covered by smoke control and smokeless zones orders confirmed or awaiting decision</i>	(3) <i>Percentage* of total black area acreage in region covered</i>	(4) <i>No. of black area premises covered by smoke control and smokeless zones orders confirmed or awaiting decision</i>	(5) <i>Percentage* of total black area premises in the region</i>
Northern .. .. .	66,497	53	279,312	51
Yorks & Humberside .. .. .	266,182	71	836,546	72
East Midlands .. .. .	89,026	33	272,224	53
Greater London .. .. .	301,088	92	2,472,382	94
North West .. .. .	252,350	62	1,052,644	62
West Midlands .. .. .	108,337	44	498,329	47
South West .. .. .	12,710	48	57,539	39
<b>Total (black areas)</b> .. .. .	<b>1,096,190</b>	<b>62</b>	<b>5,468,976</b>	<b>70</b>
<b>Outside black areas</b> .. .. .	<b>240,887</b>		<b>634,103</b>	
<b>Grand Totals</b> .. .. .	<b>1,337,077</b>		<b>6,103,079</b>	

\* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (eg: there may be some areas of open country).

# New Smoke Control Orders

The lists below are supplementary to the information in the last issue of **Clean Air (Winter 1973)** which gave the position up to **30 September 1973**. They now show changes and additions up to **31 December 1973** and a reconciliation of 1973.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

## ENGLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

#### Northern

Blaydon U.D. (No. 5), Darlington C.B. (Nos. 8 and 9), Gateshead C.B. (No. 15), Gosforth U.D. (Nos. 3 and 4), Hartlepool B.C. (No. 23), Hebburn U.D. (No. 14), Jarrow B.C. (Nos. 7, 8, 9 and 10), Newburn U.D. (Nos. 16, 17, 18 and 19), Newcastle-upon-Tyne C.B. (No. 8), South Shields C.B. (Nos. 9, 10, 11, 13, 14, 15, 16, 17 and 18), Sunderland B.C. (Nos. 10 and 11), Teesside C.B. ("E", "F", "G" and Nos. 10, 12 and 13), Wallsend B.C. (No. 7), Whickham U.D. (No. 12).

#### North West

Accrington B.C. (No. 11), Audenshaw U.D. (No. 7), Birkenhead C.B. (No. 9), Blackburn C.B. (No. 13), Bolton C.B. (Bradford Ward and West Ward No. 5), Colne B.C. (No. 10), Eccles B.C. (Nos. 16 and 17), Failsworth U.D. (No. 11), Farnworth B.C. (No. 7), Fulwood U.D. (No. 4), Heywood E.C. (No. 11A), Kearsley U.D. (No. 6), Litherland U.D. (No. 3), Little Lever U.D. (Nos. 2 and 3), Manchester C.B. (Mount Road), Middleton B.C. (No. 20), Preston C.B. (Nos. 26, 27 and 28), Runcorn U.D. (No. 9), St. Helens C.B. (No. 8), Stalybridge B.C. (Brushes Estate and Huddersfield Road/Copley Estate), Stockport C.B. (Heavily/Hillgate 1970), Urmston U.D. (No. 12), Wallasey C.B. (No. 17), Westhoughton U.D. (Nos. 7 and 8), Wigan C.B. (No. 10), Worsley U.D. (Nos. 10 and Wharton No. 11).

#### Yorkshire and Humberside

Darton U.D.C. (Nos. 19, 20, 21 and 22), Elland U.D. (West Ward), Huddersfield C.B. (Bradley-Plain), Kingston-upon-Hull C.B. (No. 13), Leeds C.B. (Nos. 106, 107, 110 and 111), Mirfield U.D. (No. 13), Pontefract B.C. (No. 9), Pudsey B.C. (Nos. 12 and 13), Rawmarsh U.D. (No. 1 Monkwood and No. 2), Royston U.D. (Yorks. No. 2), Sowerby Bridge U.D. (Nos. 10, 11 and 12), Wath-upon-Deane U.D. (Nos. 5, 6 and 7).

#### East Midlands

Arnold U.D. (No. 12A), Beeston and Stapleford U.D. (No. 14), Carlton U.D. (No. 11), Derby C.B. (Nos. 20, 23 and 24), Ilkeston B.C. (No. 8), Kirkby-in-Ashfield U.D. (Nos. 7 and 8), Leicester C.B. (Nos. 31, 32 and 33), Mansfield Woodhouse U.D.C. (Nos. 3 and 7A), Sutton-in-Ashfield U.D. (No. 1), West Bridgeford U.D. (No. 2).

#### West Midlands

Bedworth U.D. (No. 5), Birmingham C.B. (No. 160), Dudley C.B. (No. 60), Halesowen B.C. (No. 36), Nuneaton B.C. (No. 7), Sutton Coldfield B.C. (Nos. 26 and 27), West Bromwich C.B. (Nos. 22, 23, 24 and 25).

#### Greater London

Barking L.B. (No. 12), Barnet L.B. (No. 15), Bexley L.B. (No. 12), Brent L.B. (Nos. 8 and 10), Harrow L.B. (Nos. 13A and 27), Havering L.B. (No. 7), Hillingdon L.B. (Nos. 20, 21 and 22), Kingston-upon-Thames L.B. (No. 22), Lambeth L.B. (No. 29), Newham L.B. (Nos. 9 and 10), Sutton L.B. (Nos. 26 and 27), Waltham Forest L.B. (No. 18), Wandsworth L.B. (No. 6).

#### Outside the Black Areas

Aylesbury B.C. (No. 3), Bentley-with-Arksey U.D. (Nos. 4 and 5), Bletchley U.D. (No. 2), Cheshunt U.D. (No. 8), Chesterfield R.D. (Nos. 14 and 20), Colne Valley U.D. (No. 2), Crewe B.C. (No. 5), Doncaster R.D. (No. 2), Easington R.D. (Peterlee No. 3), Glossop B.C. (No. 6), Grantham B.C. (Nos. 20 and 21), Harrogate B.C. (No. 2), Hazel Grove and Bramhall U.D. (No. 8), High Wycombe B.C. (No. 19), Leyland U.D. (No. 1), Longendale U.D. (No. 1), Luton C.B. (Nos. 10 and 11), Marple U.D. (No. 6), Meriden R.D. (No. 7), Northampton C.B. (Nos. 9 and 10), Oxford C.B. (No. 12), Portsmouth C.B. (No. 1), Potters Bar U.D. (No. 5), Preston

R.D.C. (Lea), Reading C.B. (No. 19), Ripley U.D. (No. 3), Royal Leamington Spa B.C. (Nos. 13 and 14), Saddleworth U.D. (No. 2), Saltburn and Marske-by-the-Sea U.D. (No. 5), Seaton Valley U.D. (No. 2), Skelmersdale and Holland U.D. (No. 8), Slough B.C. (No. 15), Southampton B.C. (No. 13), Southport C.B. (Nos. 2 and 3), Southwell R.D.C. (No. 1), Stanley U.D. (Burnopfield No. 1 and Lintz No. 2), Stevenage U.D. (No. 1), Stockbridge U.D. (No. 2), Swadlincote U.D.C. (No. 4), Tamworth B.C. (No. 8), Watford B.C. (No. 9), Wellington (Salop) U.D. (No. 2), Whiston R.D. (Central Area), Whitley Bay B.C. (No. 10), Workington B.C. (No. 2), Worksop B.C. (No. 2), Wortley R.D. (Grenoside).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

#### Northern

Blaydon U.D. (No. 6), Gateshead C.B. (Nos. 16 and 17), Jarrow B.C. (No. 13), Newcastle-upon-Tyne C.B. (No. 18), Teesside C.B. (No. 17).

#### North West

Bebington B.C. (No. 17), Dukinfield B.C. (Nos. 17 and 18), Eccles B.C. (No. 19), Fulwood U.D. (No. 5), Oswaldtwistle U.D. (No. 5), Widnes B.C. (Nos. 12 and 13), Wigan C.B. (No. 12), Worsley U.D. (Nos. 13 and 14).

#### Yorkshire and Humberside

Barnsley C.B. (Nos. 18, 19 and 20), Batley B.C. (No. 9), Dearne U.D. (No. 10), Halifax C.B. (Nos. 19 and 20), Mexborough U.D. (No. 3), Royston U.D. (Yorks WR No. 3), Swinton U.D. (No. 16).

#### East Midlands

Chesterfield B.C. (No. 8), Ilkeston B.C. (No. 9), West Bridgeford U.D. (No. 3).

#### West Midlands

Coventry C.B. (No. 17), Solihull C.B. (No. 18), Stoke-on-Trent C.B. (No. 28), Stourbridge B.C. (No. 32), Sutton Coldfield B.C. (Nos. 29 and 31), Walsall C.B. (No. 18), Warley C.B. (No. 11), Wolverhampton C.B. (No. 19).

#### South West

Bristol C.B. (No. 11).

**Greater London**

Bromley L.B. (Nos. 19 and 20), Hillingdon L.B. (Nos. 23 and 24), Merton L.B. (No. 27), Waltham Forest L.B. (Nos. 19 and 20).

**Outside the Black Areas**

Bedford B.C. (No. 8), Burton-upon-Trent C.B. (No. 4), Crewe B.C. (No. 6), Flaxton R.D. (Huntingdon No. 1), Grantham B.C. (No. 22), Guildford B.C. (No. 1), Harrogate B.C. (No. 4), Hebden Royd U.D. (No. 2), Lancaster B.C. (No. 8) and Lancaster R.D. (Joint S.C.C.), Ramsbottom U.D. (No. 7), Seisdon R.D. (No. 3), Southwell R.D. (No. 3), Watford B.C. (Nos. 10 and 11), Wilmslow U.D. (No. 13), York C.B. (No. 4).

**NEW SMOKE CONTROL ORDERS  
SUBMITTED BUT NOT YET  
CONFIRMED**

**Northern**

Darlington C.B. (No. 10), Gosforth U.D. (No. 7), Hartlepool C.B. (No. 26), Teesside C.B. (Nos. 18 and 19), Wallsend B.C. (Nos. 8, 9 and 10).

**North West**

Bebington B.C. (No. 26 [2]), Blackburn C.B. (No. 15), Bolton C.B. (West Ward No. 6), Colne B.C. (No. 11), Horwich U.D. (No. 6), Runcorn U.D. (Nos. 10 and 11).

**Yorkshire and Humberside**

Barnsley C.B. (Nos. 19 and 20), Leeds C.B. (Nos. 116 and 117), Wakefield C.B. (Eastmoor No. 2 and Primrose Hill No. 1), Wath-upon-Deane U.D. (No. 8).

**East Midlands**

Beeston and Stapleford U.D. (No. 15), Ilkeston B.C. (No. 9), Kirkby-in-Ashfield U.D. (No. 9), Leicester C.B. (Nos. 34 and 35).

**West Midlands**

Dudley C.B. (No. 61), Walsall C.B. (Nos. 18 and 19), West Bromwich C.B. (No. 26).

**South West**

Bristol C.B. (Nos. 12, 14 and 22).

**Greater London**

Croydon L.B. (No. 16), Harrow L.B. (No. 29), Kingston-upon-Thames L.B. (No. 23), Merton L.B. (No. 28), Sutton L.B. (No. 29).

**Outside the Black Areas**

Basildon U.D. (No. 10), Blackburn R.D. (No. 4), Bletchley U.D. (No. 3), Flaxton R.D. (Huntington No. 1), Gillingham B.C. (No. 6), Grantham B.C. (No. 22), Harrogate B.C. (No. 5), Heanor U.D. (No. 4), Hemel Hempstead B.C. (High Street/Piccotts End), Leyland U.D. (No. 2), Lincoln C.B. (No. 8), Luton C.B. (No. 12), Oadby U.D. (No. 1), Oxford C.B. (Nos. 13 and 14), Ramsbottom U.D. (No. 7), Rawtenstall B.C. (No. 8), Royal Leamington Spa B.C. (No. 15), Southampton C.B. (No. 14), Stevenage U.D. (Nos. 2 and 5), Trawden U.D. (The Trawden S.C.O. 1973), Wellington U.D. (Salop No. 3), Worksop B.C. (No. 3).

**NORTHERN IRELAND**

**NEW SMOKE CONTROL ORDERS  
IN OPERATION**

Ballymena B.C. (No. 2), Lurgan B.C. (No. 5), Craigavon D.C. (No. 1 Var. B.), Castlereagh R.D.C. (No. 7), Belfast C.B.C. (No. 11).

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET IN  
OPERATION**

Newtownabbey U.D.C. (No. 8), Antrim R.D.C. (No. 3).

**WALES**

**NEW SMOKE CONTROL ORDERS  
IN OPERATION**

Wrexham B.C. (Nos. 4, 5, 6, 7 and 8).

**SCOTLAND**

**NEW SMOKE CONTROL ORDERS  
CONFIRMED BUT NOT YET  
IN OPERATION**

Dumfermline (Baldridgeburn / Beveridgewell / Rumblingwell / Castleblair), Falkirk (No. 11), Renfrew County (Houston New Community).

**SMOKE CONTROL****SUSPENSION ORDERS**

Dartford B.C. 5.1.1974-28.2.1974 (16 orders made up to and including September 1972), Dartford R.D.C. 16.2.1974-22.4.1974 (all 3 Operative Orders), Knottingley U.D.C. 16.2.1974-31.3.1974 (all 8 Operative Orders), Pontefract B.C. 14.2.1974-31.3.1974 (all 9 Operative Orders), City of Sheffield 16.2.1974-22.4.1974 (all 27 Operative Orders).

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## NEW NSCA BOOKLET

The Society has produced a new booklet "Pollution", which introduces the whole subject of pollution to school children and students and which should be of help to pupils doing "O" level projects.

Major forms of air, noise, water and land pollution and their effects are explained, together with a brief consideration of existing legislation and the changes that this has brought about. Illustrations and diagrams convey a realistic picture.

Copies of the booklet are being distributed free of charge to individual school children thanks to the generosity of the VIth Form of King Alfred's School, Wantage, who recently made a contribution to the Society for this purpose. The booklet may, however, be purchased for 10p and there are suitable price reductions for orders of 25 or more copies.

The Society would welcome suggestions or comments on this booklet from teachers involved with pollution projects, as a guide for further publications.

# STRAW BURNING

## DISPOSAL OF AGRICULTURAL STUBBLE BY FLAME BURNING

by

A. W. Howland, Esso Research Centre, Abingdon, Berkshire

*During 1973 considerable publicity, often adverse, occurred in the UK on the practice adopted by many farmers of burning the stubble left after harvesting. When carried out in an uncontrolled way there are major risks of local environmental damage, fire hazards and smoke pollution.*

*Recent work by Esso Research Centre in conjunction with O & J House Ltd., Blandford Forum, Dorset, has led to the development of a new agricultural machine for the burning of stubble. Extensive trials in the UK through 1972/73, combined with commercial use of the equipment, have shown that besides overcoming the various hazards inherent in uncontrolled stubble burning improved performance can be obtained.*

*This report reviews progress to date in this new approach to the disposal of agricultural stubble.*

### Early Work on Flame Cultivation

In the USA, flame cultivation is an established agricultural technique and specialised burner equipment has been available for many years for a variety of purposes, e.g. to destroy vegetable haulm and control weeds, fungi and pests. Not so in Europe; despite considerable interest and experimental work it is only now that controlled flame techniques are at last gaining acceptance in the agricultural industry.

A major reason for the delay of flame cultivation in Europe has been the lack of suitable equipment for European conditions which is well illustrated by Esso Petroleum Co.'s early experience in this area in the 1960s.

Encouraged by the success of flame cultivation in the USA, Esso companies in Europe initiated trials on flame burning of stubble and weeds in vegetable crops in 1964. US type equipment fuelled by LPG (liquid petroleum gas) was used in these early trials. These trials showed the potential advantage of burner systems for clearing stubble and controlling the growth of weeds but the equipment was too heavy and cumbersome for European conditions and operating costs were very high.

In 1966 UK flame equipment became available utilising kerosene as main fuel but LPG was also required to ignite it and pressurise the kerosene tank during operation. Once again the trials showed the potential advantages of flame burning for clearing stubble and controlling weeds but the general inadequacy of the equipment was also evident. Thus, the dual LPG/kerosene fuel system was inconvenient in practice and reignition of the burner after a stoppage was tedious. Thermal cracking of the kerosene resulted in carbon deposits which restricted the fuel flow and gave rise to flame failure. As a consequence, operating costs were high.

### Development of current burner unit

The early trials in the 1960s while not successful commercially underlined the problems that had to be solved before a commercially acceptable version of flame

cultivation equipment could be introduced in Europe. A clear need for this type of equipment, however, was indicated by the agricultural industry. Thus, in Holland where some of the early trials were held the Institute of Agricultural Technology and Rationalisation (ILR) saw a future for a reliable burner system for flame cultivation to eliminate, or at least reduce, toxic chemical weed disposal treatments.

What was needed, however, was a reliable burner system operating on a single low cost fuel. So, in conjunction with Esso Netherlands a burner manufacturer set out to develop a suitable burner system.

The system ultimately developed was designed to use 35 sec. heating oil as the sole fuel. A pump driven off the fan unit supplied fuel under pressure ensuring good atomisation and complete combustion without carbon formation. The fan units driven by the tractor power take-off provided air for combustion and secondary air for stabilisation of the flame. The rate of fuel consumption was controlled by a pressure regulator. Manual ignition of the burner was safe and simple.

By 1970 the burner had been comprehensively tested mainly for potato haulm burning and patent applications filed. Today, it is fitted to various types of flame cultivation equipment in commercial use in the Netherlands and elsewhere.

### UK development of machine for stubble burning

From the time of the early Esso trials UK farmers have continued to express a strong interest in the flame burning of stubble. Since a proved burner system was now available Esso Petroleum Company re-considered the need for this equipment in the UK and in 1972 further trials were initiated in conjunction with O & J House Ltd., agricultural and landscape contractors. For these trials the well proved Dutch burner system was used but additional equipment also had to be developed to optimise performance in stubble burning.



*Stubble burner unit showing heat shield*

The complete unit as finally developed is shown in the illustration. It consists basically of the burner unit which contains 20 separate gas oil burners which discharge a flame along the ground under a specially designed "heat shield". This heat shield is lined with refractory to minimise heat loss and the purpose of the shield is to concentrate the flame close to the ground so that the stubble is burned efficiently. Some further details of the machine are given in the following table:

*Dimensions:*

Overall height burner unit	4 ft 9 in
Height burners above ground	8 in
Overall depth	3 ft 3 in
Overall width	11 ft
Width burner	10 ft
Heat shield	10 ft x 4 ft

*Burner system*

Consists of 20 nozzles fitted into 5 sections of air chambers. Each nozzle delivers 2.9 gals/hr. at 100 psig.

*Tractor*

Any tractor with a standard power take off can be used but a medium size tractor with 3 part linkage so that machine can be lifted is preferable.

The flame coverage by the machine is 10 ft per pass or about 4 acres/hour at a tractor speed of 4/5 mph.

**Performance of stubble burner**

Commercial production of this new stubble burning machine started in the UK in 1973 and during the 1973 season, having first removed the straw from the field or burned off the swathe in the conventional manner, many thousands of acres of stubble have been successfully treated by this technique.

Results to date suggest that the machine can make a real contribution to land cultivation after harvesting ensuring that a more complete burn is obtained. A greater degree of control is possible on the burning process—even in windy conditions which can be quite hazardous with conventional methods—because of the ability of the machine to obtain a complete burn when working against the wind. The intense rate of burning also results in a substantial reduction in overall smoke emissions. The fact that an operator must be present at all times through the burning operation is an additional obvious safeguard.

Evidence has also been obtained to suggest that flame treatment with this type of machine can be a valuable aid when Direct Drilling. The technique of Direct Drilling is to first clear the field of growing grass and weeds. This is generally achieved by chemical treatment which kills the growth but does not kill the root or affect the soil. After a few days, the farmer can then run over the field with a Direct Drill which cuts a slot in the soil and deposits seed and fertiliser at a prescribed rate. The job can then be completed in one operation.

One problem with Direct Drilling, however, is that if the field has trash on it in the form of stubble and dead weed, this can clog the machine. Clearance of the trash by flame burning has been shown to overcome this problem very effectively.

#### Conclusion

Despite its fairly long history flame cultivation and controlled stubble burning is still a new technique to UK agriculture. Tests to date suggest that it can be a valuable

and safe method of cleaning land prior to cultivation. Still to be proved out, however, are a number of other potential advantages which could be of considerable importance to the cereal farmer, e.g. its effectiveness in destroying weed seeds (the wild oat), straw carried and green leaf diseases.

Finally, the technique should offer an effective method of overcoming many of the environmental hazards which have occurred in the traditional method of firing stubble, e.g. fire hazards and smoke pollution.

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## Advisory Council For Agriculture and Horticulture Report on Straw Disposal

In a Written Reply to a Question by Mr. Ralph Howell, M.P., in the House of Commons on 17th January asking whether he had completed his consideration of the report by the Advisory Council for Agriculture and Horticulture in England and Wales on straw disposal, and if he would make a statement, the Rt. Hon. Joseph Godber, M.P., Minister of Agriculture, Fisheries and Food, said:

"I have now received from the Advisory Council for Agriculture and Horticulture in England and Wales their report on straw disposal. I am arranging for its publication.

"The report states that, of the total quantity of straw produced, about two-thirds is put to productive use and about one-third burnt. Burning occurs mainly in the major grain-growing areas where the surplus for which no economic use can be found is very large. In the short term, the Council conclude that, for economic and technical reasons, there is at present no practical alternative to burning for a good deal of the straw. But they make several detailed suggestions for increasing the productive use of straw in the longer term, and these I am following up.

"The Council consider that farmers should do all they can to avoid smoke and smuts becoming a nuisance or a

hazard to others or to themselves. As to the prevention of damage by fire, they attach particular importance to the more complete observance of the National Farmers' Union's straw burning code. They recommend that the code should be reviewed, and make suggestions for its improvement. I believe that this is both urgent and essential and have commended these recommendations to the National Farmers' Union for their consideration. My officials will be at their disposal as hitherto to assist them in their work.

"The Council have no criticism to offer of the present law relating to straw burning but observe that further control could be provided by the adoption by local authorities of a model by-law to be drafted by the Home Office. Such a by-law has been drafted and is now available to local authorities. Wide publicity will be given to the new arrangements in due course which, I hope, will have a marked effect on the nuisance and damage from these fires which cause such offence at present."

Copies of Report on Straw Disposal by the Advisory Council can be obtained from the Secretary of the Council, Mrs. H. I. Pinkerton, of the Ministry of Agriculture, Fisheries and Food (Tel. 01-834 8511, Extn. 7333). A copy is available in the Society's library.

National Society For Clean Air

# NEWS FROM THE DIVISIONS

## EAST MIDLANDS

Members were welcomed on 6th September last at a meeting held in Peterborough by the Rt. Worshipful the Mayor of Peterborough, Councillor H. R. W. Laxton, M.A., who said that he was pleased to welcome the Division to Peterborough and trusted that they would spend an interesting and rewarding day. The concentration of smoke in Peterborough was now 48 micrograms per cubic centimeter which was a 48 per cent improvement on 1972.

The parent society, the National Coal Smoke Abatement Society began 74 years ago, but it was only during the last 10 years that the public had become aware of the necessity for clean air. This was no fault of the Society, but a lack of a proper order of priorities. There was now an environmental literacy and people were very well informed. In Peterborough it was the intention to make the whole area smokeless as soon as possible.

Ten years ago pollution was outside the ambit of society. Environment was a somewhat dirty word. Now it is used quite frequently. Nothing succeeds like success. The Mayor quoted Sheffield as an example of a town which he had known when it was dirty and smoky, but returning recently he had found that clean air was the watchword. The authority had managed to catch public interest. If people wanted to improve the surroundings they must join in the debate about it.

The Mayor referred to the project which had been initiated for children to measure pollution by the Advisory Centre for Education in conjunction with the Sunday Times Magazine. This had been done by observing lichens and from the results the Monks Wood Station had prepared what was known as the "mucky map of Britain". The project had caught the imagination of the nation's children and quotations were given from some of the pupils' comments. Following on this the advanced centre had formed a club called "Watch" to take further part in the environmental problems and were now producing a termly magazine called "Watchword", the latest of which dealt with noise.

All the research and reports are of little value unless Governments act upon them. To do this it is necessary to press for funds. Dr. Clifford Sharp of Leicester has recently written a long report entitled "Living with a Lie" in which important recommendations are made. In conclusion the Mayor said that he felt that we could look forward optimistically so far as pollution was concerned. Alderman Robinson thanked the Mayor for his excellent welcome to the members, and then commenced the business meeting by inviting the Secretary to give any apologies.

Apologies were received from Mr. H. Maddock, Councillor D. Savidge, Mr. E. F. Richley, Mr. J. B. Sheard and the Belper R.D.C. representative, Mr. G. H. Earnshaw, Councillor Mrs. Townroe, Mr. G. Spencer, Councillor Mrs. Tideswell, Mr. J. B. Brackenbury, Councillor J. Bramley, Mr. A. Wild, Mr. W. R. Brownhill, Mr. D. Brook, Mr. A. Murray, Councillor J. R. Huckle and Councillor F. A. Madin.

Alderman Robinson then invited Mr. W. Combey, the Chairman of the Society to address the meeting. Mr. Combey said it was his first visit since becoming Chairman and it was a pleasure to renew the acquaintance of an old friend in Mr. John Hall, the Chief Inspector of Peterborough. Mr. Combey said he had recently retired after 50 years in local government and it was a pleasure to be elected at the end of so long a term of office. Mr. Combey said the old adage "where there's muck there's brass" was wrong. Where there was muck there was pollution. It was important not to lose the forward movement in local authority work when much was changing. Clean air is a must and pollution drives are a must. The Society was encouraged by the enthusiasm being shown and was reorganising to coincide with local government reorganisation. 1974 would also be the 75th anniversary of the Society and it was hoped that something would be done to mark that occasion.

Alderman Robinson thanked Mr. Combey for his comments and invited questions from the members present. These dealt with stubble burning, with the proposed wider interests of the Society and with the new district heating scheme being operated in Nottingham.



*The Area Manager, Eastern Counties Omnibus Co. Ltd., shows Alderman Robinson, Mr. Combey and Professor Mellanby the batteries incorporated in an electric bus.*

This concluded the business meeting and the Chairman then invited Mr. T. Henry Turner to introduce the speaker, Professor Kenneth Mellanby, C.B.E., Sc.D., F.I.Biol., Director of Monks Wood Experimental Station, Huntingdon. Mr. Turner said we were pleased and proud that Professor Mellanby was to address us. He had made his natural and acquired talents serve the community in many ways. Mr. Turner then outlined Professor Mellanby's academic achievements, the many important posts which he had held both in England and abroad, the many honours conferred upon him and also made reference to a number of books which Professor Mellanby had written. Mr. Turner said that in Professor Mellanby's book on pesticides and pollution there was no mention of the Clean Air Act and equally our own Society's Clean Air Book for 1973 failed to mention Monks Wood Experimental Station. It was good that we had now got to know one another because our Society had no one among its subscribers who was so skilled in insect physiology, ecology, medical and agricultural entomology and biological subjects as Professor Mellanby.

Professor Mellanby said that he was pleased that the National Society for Clean Air tried to emphasise things which really needed action taking against them. There was a tendency in some quarters to put too much emphasis into things which didn't matter. In dealing with pesticides they were too concerned with chemical analysis, and did not distinguish between trivial and unimportant levels and those at which damage was done. This is not easy to achieve since damage can be demonstrated but the harmlessness of any given concentration cannot be so readily demonstrated.

Monks Wood Experimental Station is concerned with the conservation of the natural flora and fauna of Britain. It is not thought that butterflies and so on are more important than man, but they are an important part of man's environment which includes not only bricks and mortar but wild life. On the health of other organisms may depend the health of man. The health of other organisms may give early warning. It is not only the beauty of the countryside but the health of the population and the good of the community generally with which they were concerned. Dr. Mellanby announced that from October 9th-14th there would be six open days when the public would be welcomed to inspect the work of the Experimental Station.

Is air pollution a serious problem from the viewpoint of conservation and if so in what way? The highest concentrations of pollution tend to be where man exists in largest numbers, and further away from this concentration of man and man's activity there are lower concentrations of pollution. There was a tendency to think that these did not matter to wildlife. Professor Mellanby then turned to the meaning of ecology and said that there was a tendency to think of an ecologist as someone telling that the end of the world was nigh and that unless we do something about the environment it will end before 1984. People have only just learnt the word. For the purposes of this talk the word is taken to mean the study of animals and plants and the totality of their environment. Originally the word meant good housekeeping. It deals with the relationship between organisms and their environment and includes man.

The examination must not be restricted to one species. It is necessary to study how the balance of the whole system is maintained and these balances may be very subtle.

Usually rural areas have less polluted air than industrial areas. The study of lichens shows that sulphur and fluorine over a wide area of the country damage these plants without reaching levels directly toxic to man. Man can move away and escape but plants cannot—they either die or fail to develop. So whilst it is easy to overstate the case—and some people have overstated it—we nevertheless have a picture with which we should not be satisfied. Even if man is lucky enough not to be hurt, there is something calling for action.

The case is difficult to prove and more work is required. Lichens are beautiful and interesting but do not obtain many votes. Crops are probably being affected more than is realised but it is difficult to show the changes. Whilst corn-growing may show differences in yield as great as 35 and 65 cwt per acre in the same field in successive years a 5% difference due to pollution is almost impossible to show. To carry out a controlled experiment on the effects of factory pollution on a field is very difficult. The ground level concentrations of sulphur dioxide are decreasing in the towns but in some rural areas the fall is not as rapid as is desirable.

Nothing is known about how this is affecting wild flowers which are part of our heritage and this is a problem to be worked on. Although the general levels are much improved in the towns they have not improved enough in rural areas and the level is in the order of magnitude where damage can be done.

Conditions are different where motor vehicle transport exists. These are passing a great many toxic substances into the air. Many are doing no harm to man or beast. If they are quickly diluted and decomposed this is a rational method of disposal but we do know of places where the environment is being damaged.

The diesel vehicle does little damage if properly maintained although it emits a smell. Frequently diesel trains are left running for lengthy periods in a station. What is the effect of the motor vehicle on wild life? The only evidence of photo chemical smog is in narrow valleys where temperature inversions occur but these are nothing like as serious as in Los Angeles.

Lead comes from petrol. If it is measured in the soil or vegetation adjacent to a major road the level will be found to be very many times the background figure. Lead is a natural element and there are places where lead ores are near the surface and the soil is heavily polluted. On many roads, for a yard or two round, the amounts become higher than desirable. A frugal farmer who collected roadside grass and took it for his stock gave them lead poisoning. Mice and voles in the shorter grass contained more than the level which would be permitted if used for human food. It is necessary to look carefully at the question of motor vehicles and to ask whether the pollution or the creatures crushed by them is the more important. They raise many problems.

The question of burning stubble had been raised at the meeting. The practice is to combine-harvest grain crops and the resulting straw is of no use for thatching etc. although it can be baled. Consequently it is burnt because of its economic advantage. If the weather conditions are suitable the farmer can burn off the straw within a few hours. The ability to go straight in and recultivate can be very attractive. The alternative is to plough the straw back but this is difficult to do because the trash results

in the plough becoming constipated. Chopped up straw can be used as a manure and is useful in the long run. The first effect is to raise the demand for fertiliser use in the next year by a considerable amount. Straw is a valuable resource if there are enough animals and instances have also occurred recently where a binder has been used in order to produce long straw since this was, in 1972, fetching twice as much, for thatching purposes, as was the grain.

It is normal to bale straw and to carry it off but this depends on obtaining a market in which the price will cover the cost of the baling and carrying. If animals need the straw this assists the situation and the high price of beef may result in more home produced animals and consequently greater demand for straw. Black grass and wild oats in crops are difficult to eliminate except by putting the fields down to grass and keeping stock and these again would create a demand for straw.

It is suggested that, by burning, weeds and pests are got rid of, but there is little evidence about pests. There is a good agricultural reason for burning with the present system which produces large cereal crops and no live stock.

Professor Mellanby said there had been much burning on two or three days during the previous week. The NFU takes a strong attitude. To minimise damage to the environment the NFU issue a code of conduct. This requires removal of straw from a wide band round the field which should be rotovated or ploughed. Burning should only be carried out when there is no strong wind. If these precautions are taken very little damage will result and whilst most farmers do this, an irresponsible few do not. Professor Mellanby cited extensive damage to hedges when stubble had been set fire to in a force 8 gale and said that he himself, though half a mile from one particular instance, had needed to have the painters in to make good the paintwork on his house and to have 12,000 books cleaned as a result of this pollution.

From the point of view of wild life this is only burning in a man-made ecosystem. Provided the farmers are reasonable they cannot be expected not to burn the material.

Professor Mellanby said that on two or three days his daily volumetric pollution gauge had shown a black circle comparable to the centre of a town. It is difficult to see how existing Acts can be used but the Ministry of Agriculture & Fisheries could possibly issue an order. Concluding his comments on air pollution Professor Mellanby said that it does have an effect on wild life and this gives a good method of measurement.

The most serious problem today, however, was the pollution of inland water. With the worst polluted air there is still enough oxygen and people do not drop dead. In water there is complete de-oxygenation by some toxic substances. Aquatic life is very much more affected by a given concentration than terrestrial animals. If man drinks polluted water he is only affected by the amount taken into his body. If this is two pints per day with a one part per million pollution load and 10 grams are needed to be taken up to cause damage, this would take 10 thousand days and it is unlikely that all of the substances would be retained in any event. Fish drink like fish. They drink several thousand times more than we do.

They take water through their gills and select the oxygen from it. They also take in the toxic substances which may be in the water.

There was an instance of fish in the Rhine being killed by Endosulphan which is used on fruit trees and is not very toxic to bees. It is however very toxic to fish. People who drink the Rhine water may have taken up one part per hundred million and if this had all been retained it would have taken 350 years at one litre per day to pick up a toxic amount. Yet the fish died within 24 hours. They are more susceptible and the polluted water tends to be deoxygenated. They have to breath four times as hard if there is a reduction to one quarter the normal amount and consequently they pick up four times as much of the other pollutants.

Sewage, agricultural effluents, factory effluents are all being tackled and maximum priority needs to be given when damage is being done. These aspects are not particularly worrying for man but it is right to make an effort for an improvement of the total environment. Turning to farm chemicals Professor Mellanby said that farming in Britain is a successful industry producing more than ever before and using only a fraction of the man power. Any other industry could be proud of this achievement but it is only at a price. Straw burning and toxic chemicals are part of that price. There are many instances of the use of herbicides being carefully carried out. The only one which has killed so far has been paraquat. No one would have suffered if it had been used properly. It has the same effect as a flame gun in that it kills the top of the plant and should not for that purpose be used on nettles since it kills the associated grass but only knocks the top off the nettles which then come up with renewed vigour in the absence of competition.

Deaths have resulted because the chemical has been put in a lemonade bottle against the regulations. Several fatal cases have occurred because the liquid has been stored contrary to all instructions. An antidote may be in the process of being developed. The question arises ought we to ban paraquat. At least one hundred times as many deaths occur by the misuse of aspirin which is one of the chief suicide drugs. There is a need for a sense of proportion.

By looking at the effect on wild life it can be seen that they are more susceptible and more easily damaged than man. This should not be accepted, there should be effort to try to improve the situation.

1970 was European Conservation Year. The biological goal was to see what we should do with our environment. This should be looked at even if we cannot achieve the desired result at once. Rivers should support the most susceptible form of fish which is trout.

Professor Mellanby then replied to a number of questions. Mr. J. Jones of Lincoln, referring to the efforts to progressively reduce the sulphur dioxide concentration in the atmosphere asked if it was true that the presence of the gas may be beneficial to plants. Professor Mellanby said that the answer to this was not really known. It applied in certain cases, but at present the gap between an optimum level and a harmful level was very narrow. If something like this was shown to be beneficial we should be worried about it.

In a contribution Mr. T. Henry Turner referred to a letter received the previous day from Dr. Meetham, in

Canada, who would be known to many of those present. This referred to a chimney 1,250 ft high on a copper works which in the early 1930s was producing pollution which ruined crops six miles away. Although the firm now recirculated 15 million gallons per day of water from the Columbia River, rainbow trout were regularly caught 100 ft downstream from the outflow. Mr. A. Wenn, Derby, asked about allegations that sulphur dioxide from England and West Germany is being found in Sweden and Norway. Professor Mellanby said an official report was due almost any day and the Swedes had certainly reported changes in acidity of the rain, but some of the readings were probably misleading. The first drops after a long period of drought showed a very high pH value but five hours later the result would be very different and there was a suggestion that like was not being compared with like. In some areas where the soil was basically poor there could be rapid changes and there were suggestions that the major effects were local and mostly caused by emissions from local sources. Councillor Mrs. D. M. Ashley of Clowne asked if there was a possibility of legislation on stubble burning. The Mayor of Peterborough said that he thought the law of nuisance might be invoked in the present situation and if there was disregard of the code of practice then the farmer might be proved negligent. The Town Clerk felt that there might be grounds for a civil action and Professor Mellanby underlined the necessity for making sure that the smuts complained of came from a particular source.

Mr. Combey referred to the suggestion that in the past sulphur dioxide deposited on the small particulate matter in the atmosphere had been more dangerous than the gas on its own and that the progressive removal of particulate matter would improve this situation. Mr. Combey also referred to the recent decisions to clean up the River Tyne at a cost of £90,000,000. Professor Mellanby said that the synergistic effect referred to by Mr. Combey had been proved to occur in the case of man but in plants it did not happen and they would still be damaged even if the sulphur was pure. The Mayor of Peterborough asked about the lime deposits affecting certain parts of the country and wondered if these were causing damage to animals and plant life. Professor Mellanby said there was not really tremendous evidence to show damage. It would lead to a high calcium intake but there would be high calcium intake in those areas even if the material were not visible. The aesthetic effect was more damaging and what was called for was an improved technique for extraction.

Dr. Riley, in proposing a vote of thanks to Professor Mellanby, said that he himself had visited the Monks Wood Experimental Station and the adjoining Reserve last year and in so far that it had kept him in open country for at least three hours this in itself had made the visit worthwhile. The investigations at the station were explained most enthusiastically by members of the staff. The stands of trees in the Reserve were left undisturbed for various times up to 20 years. Dr. Riley said that Professor Mellanby was a man with balanced views. The work was not based on old wives' tales, but on the best available information at the present time. The work was having a direct effect, for instance, on the mortality of people in Africa. There was no doubt that we had this morning been listening to a world authority.

Mr. J. Jones, Chief Public Health Inspector, Lincoln, proposing a vote of thanks to the Mayor and City Council of Peterborough, said that the Mayor in his opening

address had shown both interest and knowledge and it was most pleasing that he had been able to stay for the morning session. Mr. Jones said that he had listened to many civic welcomes but this had certainly been amongst the most interesting. The thanks of the Society were due to the Mayor and City Council for affording the Society the opportunity to meet in Peterborough and also for the hospitality which was to be provided.

This concluded the morning session and the meeting then adjourned for lunch.

Following the lunch the members divided into three parties. The first party were taken by coach round the Peterborough Development Area where they had the opportunity of inspecting a show house in part of the Bretton Development together with the large district heating centre adjacent to the Sainsbury/Boots superstore. The guide on this tour was Mr. D. Bath, Deputy Planning Officer, Peterborough Development Corporation. Following this members again left the bus at the special tree nursery which has been set up to provide trees and shrubs for landscaping the development area and which currently contains more than 1 million trees and shrubs. A member of the staff at the nursery answered questions put by members following which the coach returned to the Town Hall where tea and biscuits were served by kind invitation of the Peterborough City Council.

A second party visited Kings Dyke Brickworks and were shown the various processes involved.

Clay is taken from the quarry by a Shell Planer which drops the cut clay on to a conveyor which transports the clay to the main plant. Here the clay is crushed in rotating rollers. The crushed clay is then transported by conveyors and falls over sieves, the correct sized particles falling through, the rest is diverted for further rolling.

The next stage is for the particles to be pressed into the "green" brick condition and conveyed to the lift-off point passing through water sprays and a sand blaster on the way which provides the facing to the bricks. At the lift-off point, the "green" bricks are hand stacked and removed by fork lift to the Kiln storage area. Here one man is employed in the emptying of the full kilns and the loading of the empty kilns at the same time.

The Kiln is of a continuous burning type being constructed in two parallel banks of 17 chambers. Three chambers are used at a time on each of the parallel banks. The first of the three chambers is being brought up to ignition temperature, drying the bricks at the same time. The second chamber is on full fire and the third is cooling down. This cooling heat is taken off by flues and passed to the next chamber which becomes Number 1 in the cycle and the process repeats itself thus providing continuous burning. All the flues used in the kiln, whether for hot air or cold air, are under the direct supervision of the Kiln Controller who works on top of the kiln. He is required to add coal via small capped firing holes in order to maintain the temperature at 1,000°C or ventilate when necessary to ensure the temperature does not exceed 1,020°C which is the critical temperature above which the bricks crack and flake thus making the whole batch non-usable. The Kiln Controller obviously is the Key Worker of the whole operation.

Once fired, the bricks are removed from the chambers and stored for despatch.

A third party visited the land reclamation site of the Electricity Generating Board off London Road, Old Fletton.

Pulverised fuel ash from three power stations in the Trent Valley is transported by rail to Old Fletton. It is then mixed to a slurry with water and pumped to the disused clay pits to be reclaimed.

The Chief Engineer gave a brief talk on the system employed in handling the fuel ash and recirculating the water needed to form the slurry. Leaflets were also distributed giving the chemical properties of the pulverised fuel ash and the type of plant life that it will sustain.

The party then visited the pump house, train unloading station, reserve reservoir and, finally, the first pit to be reclaimed. This area has been grassed and has produced its second crop of hay.

*E. F. Raven  
Hon. Secretary*

## Steps to a Clean Air Future

by

T. Henry Turner

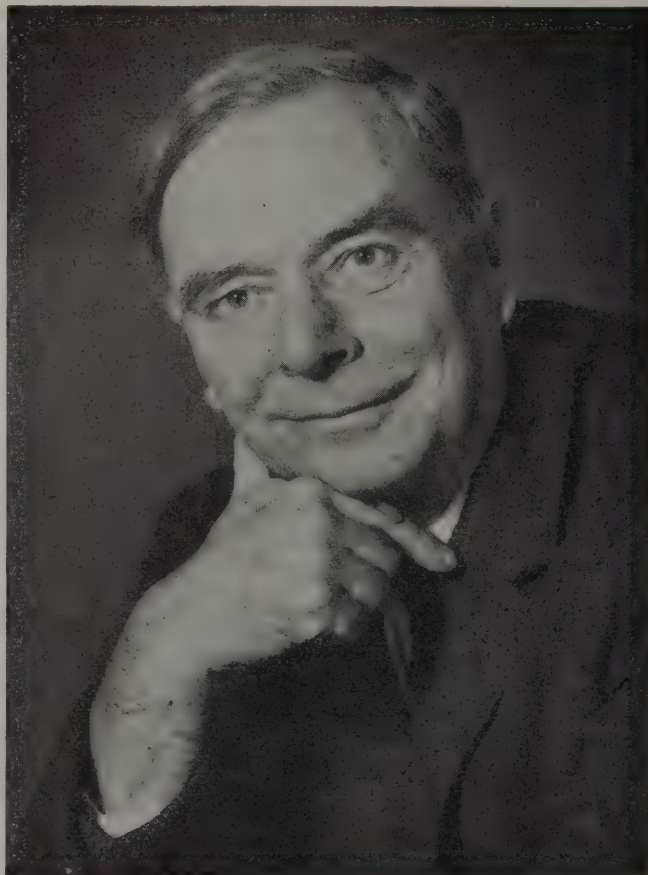
We are nearing the centenary of the 1875 Public Health Act which contained a smoke abatement section upon which much legislation has since been based.

In 1912 the International Smoke Abatement Exhibition, organised by the Coal Smoke Abatement Society, in London, led to the formation of a committee for the Investigation of Atmospheric Pollution. People now in the prime of life may tend to date our present clean air era from the report of a later committee on air pollution, The Beaver Committee, of 1954. Older members of our Society may recall earlier pioneering investigations that provided essential guidelines between 1912 and 1954.

From 1934 to 1950 the Chairman of the Atmospheric Pollution Committee was Gordon Miller Bourne Dobson, C.B.E., F.R.S., D.Sc., formerly Reader in Meteorology, University of Oxford. He was born on 25th February 1889 and educated at Sedbergh, and Caius College, Cambridge. Now living at Shotover, Oxford, Dr. Dobson recently published an important paper on the Ozone in the Upper Atmosphere. It was during his Chairmanship that the City of Leicester was chosen for the Department of Scientific and Industrial Research's three-year investigation into the causes and effects of atmospheric pollution. This was the first big, scientifically planned and organised, air pollution survey of any city; although there had been a much smaller, earlier pilot survey in Norwich.

Among the readers of "Clean Air" there must be many who have been responsible for determining the concentration of suspended matter in the air, using apparatus assembled according to Part 2, of British Standard No. 1747, and of sulphur dioxide according to its Part 3. Upwards of 1,200 sets of that standardised apparatus have been used in Britain's National Survey of Air Pollution. The newspaper photograph, dated 1937, shown on the facing page shows some of the prototypes from which those British Standard sets of apparatus were developed. The air pollution investigator sitting there at work is Dr. A. R. Meetham.

It was not until fifteen years later that he published his textbook on "Atmospheric Pollution its Origins and Prevention", a very useful book of 268 pages that appeared just before the most fatal "smog" of 1952; the book's third edition, dated 1964, has 301 pages.



*Dr. A. R. Meetham*



*Dr. A. R. Meetham working on the Leicester air pollution investigation in 1937*

By that time a still larger textbook, Alan Gilpin's "Control of Air Pollution", had appeared with 514 pages. Both of these single author masterpieces have helped most of those who have lately been named Environmental Health Officers.

Dr. A. R. Meetham was born on 1st January 1910, appropriately it would seem for a pioneer investigator of air pollution, in Sheffield, then one of the dirtiest cities and now one of the cleanest. After attending Sheffield's King Edward VII school, he proceeded to Queen's College, Oxford.

It was from 1936 to 1939 that he worked for the Department of Scientific and Industrial Research, in charge of their Leicester City air pollution investigation. For the next seven years he still worked for the D.S.I.R. but in the National Physical Laboratory, Teddington. He was then transferred to work at the Fuel Research Station, Greenwich, from 1947 to 1950. That station was located on an unpleasantly dirty site, beside the big, old, South Metropolitan Coal Gas Works. When the Warren Spring Laboratories were later built on a pleasant site at Stevenage, the air pollution investigation headquarters were moved there. From 1950 to 1960 Meetham worked in the Physics Department of the National Physical Laboratory, glad to have returned to Teddington. Then he transferred to their new Computer Science Department, from which he retired a decade later. In his retirement he has been happily engaged as a busy Staff Tutor in Mathematics, London Region, of the Open University.

It was during the thirteen years that he spent investigating air pollution for the D.S.I.R. that we first met; while he was at the National Physical Laboratory. As the Chairman of the Iron and Steel Institute's Atmospheric Corrosion Sub-Committee I sought more detailed information about air pollution. Dr. Meetham kindly gave me helpful advice that was just what I needed before having four "volumetric test sets" made and used in my London, Doncaster and Darlington laboratories of the remunerative, old, steam-engined, London and North Eastern Railway, in 1945.

In the following five years until Meetham returned from Greenwich he wrote, according to our Society's Information Officer's record, the following four papers:

- |      |  |
|------|--|
| 1946 | Turbulence and Atmospheric Pollution (in "Weather", November)  |
| 1947 | The Measurement of Atmospheric Pollution (Nat. Smoke Abatement Soc. Ann. Conf., Edinburgh)             |
| 1949 | The Work of the D.S.I.R. on Atmospheric Pollution (reprinted from "Coke and Gas")                      |
| 1950 | Natural Removal of Pollution from the Atmosphere (Quarterly Journal of the Royal Meteorology Society). |

# National Society for Clean Air

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### **SOUTH-EAST**

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### **SOUTH WALES and MONMOUTHSHIRE**

L. Morgan, 9 Lodge Drive, Baglan, Port Talbot (5231)

The parent of the Society was the Coal Smoke Abatement Society, established in London in 1899. It did valuable pioneering work and accomplished the first necessary stage of making it understood that clean air was not the pet notion of a few cranks. It co-operated with a provincial association that had been formed in 1909—the Smoke Abatement League of Great Britain. These two bodies amalgamated in 1929 to form the National Smoke Abatement Society. This name was retained until 1958, when it was changed to the present one.

From a handful of individuals the Society's membership has grown to include not only considerable private membership both at home and abroad, but membership of local authorities, corporate bodies, (representing the Learned Societies and Institutions),

the fuel industries and those industries concerned with the production of appliances and equipment connected with clean air.

The Society is a voluntary body and receives no official grant, and therefore essentially subsists on the subscriptions of its members. The general policy of the Society is Directed by the Executive Council and its Committees. There are twelve Divisional Councils of members, with their own committees and honorary officers.

The Society's objects are, in brief, to promote and create by publicity and education an informed public opinion on the value and importance of clean air and to initiate, promote and encourage the investigation and research into all forms of atmospheric pollution in order to achieve its reduction or prevention.

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# The City of London and Clean Air

## 1273 A.D. to 1973 A.D.

by

**Betty R. Masters, B.A., F.S.A.**

Deputy Keeper of the Records, The Corporation of London

In July 1973 the Corporation received one of the Arnold Marsh Clean Air Awards presented by the National Society for Clean Air. These new awards, named by the Society in honour of its first Director, the late Arnold Marsh, were granted for outstanding services to the cause of clean air to two individuals, two industries and three local authorities, the City of London, the City of Salford, and the City of Sheffield. The award to the Corporation was made in recognition of "an outstanding success in clean air measures" not only in the City of London but also over the seventy miles of waterway in the Thames Estuary. In the City the Corporation was in 1954 the first local authority to designate its whole area a smokeless zone and in 1971 the first to acquire parliamentary powers to prohibit the burning of sulphurous fuel as defined on the last page of this article. On the Thames the Corporation as Port Health Authority had waged a highly successful campaign to reduce and control the emission of smoke from ships, harbour craft, cranes, locomotives and shore installations in the Port of London.



*Mrs. Doris Marsh presents Mr. Cohen with the Award for the Corporation of London*

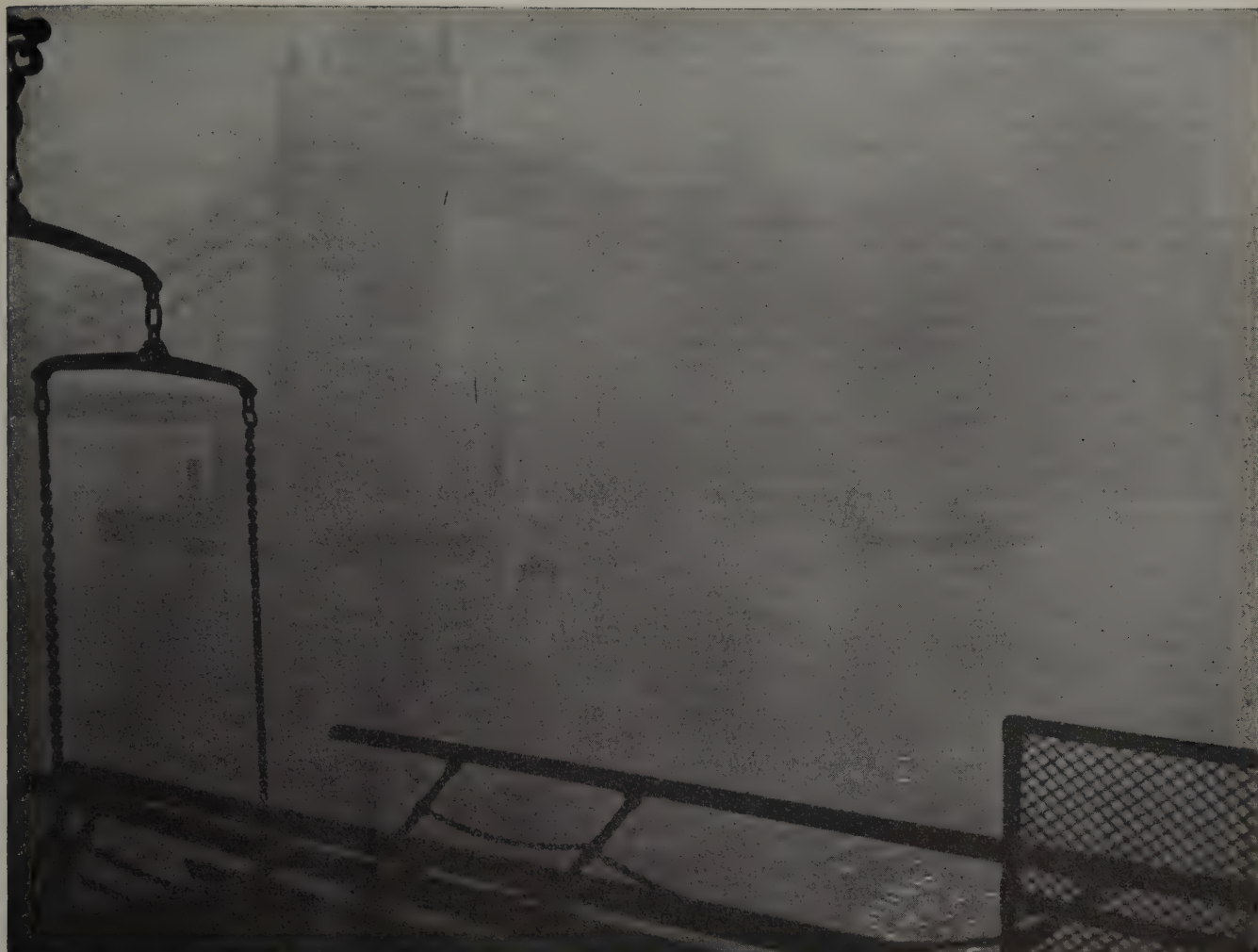
The award was based upon these modern achievements but at the same time it was acknowledged that the City of London had been concerned about air pollution problems for centuries. This was indeed so. Nuisance from smoke, which until the middle of the present century was regarded as the principal element in pollution of the atmosphere, was a matter which exercised the attention of the medieval as well as the modern authorities. From the earliest times of which we have a record, the problems of local government in London were distinctly urban problems. The water supply, adulteration of food, the cleansing, paving and lighting of the streets, building regulations, the removal of refuse, and the suppression

of nuisances of many kinds, including both smoke and noise, were all subjects of concern to the mayor and aldermen in medieval times. Within the customs, standards and limits of knowledge of the times, the Corporation has a long tradition of care in these matters for the health and welfare of the citizens, and the consciousness of the City of the need for clean air can be demonstrated to extend back to the fourteenth century at least.

In 1371 certain people living in Cannon Street, or Candelwykestrete as it was then called, and in St. Clement's Lane, Eastcheap, complained to the mayor, recorder and aldermen that two plumbers were using a vacant piece of ground in the neighbourhood for the melting of solder "to the great damage and peril of death of all who shall smell the smoke from such melting", for "whosoever has smelt the smoke therefrom, has never escaped without mischief". The mayor and aldermen, after hearing the evidence of other witnesses, came to the conclusion that the complaint was somewhat exaggerated, but nevertheless ordered that the shaft of the melting furnace should be heightened for the benefit of the people living in the neighbourhood in order to carry the smoke away.

This incident has several features of interest. In the first place it illustrates the most usual method of dealing with air pollution until the nineteenth century, i.e. not by general regulation but by orders arising from specific complaints. An Assize of Nuisance established towards the close of the twelfth century by Fitz-Aylwin's Assize of Building was the remedy for settling disputes between neighbours concerning property rights and nuisances of all kind. The court consisted of the mayor, sheriffs and aldermen, and a view of the premises was taken, occasionally by the aldermen themselves but more often by the sworn viewers or by an assize jury summoned for the verification of facts. If the complaint was substantiated, then an order was given for abatement of the nuisance. In the seventeenth century complaints were usually laid before the Court of Aldermen which instructed the surveyors or the sworn viewers to view the premises and report.

Secondly the case of the plumbers of 1371 makes it clear that smoke and fumes were objected to not only because of their unpleasantness but also because they presented a danger to health. And, thirdly, this instance of smoke nuisance is typical of many in the medieval period, and later, in arising from a manufacturing source. For centuries the City of London has been not only a great trading and commercial centre but also a manufacturing town. The furnaces of the smelters of iron and of the metal workers, the melting houses of the tallow chandlers, the boiling house of the soap makers, the kilns of the lime-burners, even bakehouses, were all causes of complaint. Sometimes the gravamen of the charge is the smoke and fumes, sometimes it is the smell caused by offensive manufactures. Often it is both, and to these complaints there is frequently added a further complaint of danger from fire. In times when a craftsman's house was normally his place of business also, his neighbours must have felt justifiable concern on all these scores. A few instances of such complaints will suffice. In 1373 the



*Tower Bridge in Fog*

neighbours of William Grene, a plasterer, complained of the obnoxious fumes caused by his burning plaster of Paris in his house. In 1377 the neighbours of Stephen atte Frythe, who had built a forge in his house in Watling Street, complained not only of noise and vibration but also that the smoke from the sea-coal which he burned in the forge entered their hall and chambers. In 1679 Thomas Legg of Coleman Street complained of the smoke from his neighbour's bakehouse. As in the case of the plumbers in 1371 the remedy suggested was to raise the chimney "soe high as to convey the smoake cleare of the topps of the houses".

Until the seventeenth century the principal fuels were timber and charcoal. Sea-coal (i.e. coal from Newcastle transported to London by sea) was used to a limited extent, and was regarded not only as unpleasant but as particularly dangerous to health since early coal gave off a cloud of choking smoke as it burned. As early as 1299 certain master smiths had agreed amongst themselves not to work at night because of the unhealthiness of sea-coal (*propter putridinem carbonis marine*) and the damage caused to their neighbours; and a royal proclamation of 1307 forbade the use of sea-coal in kilns in Southwark, Wapping and East Smithfield. Problems of smoke pollution were intensified in the seventeenth century both by the growth of London and by the change from timber to coal as the principal fuel which was brought about largely as a result of deforestation. John Evelyn, the

diarist, wrote in his *Fumifugium*, published in 1661, of the "Hellish and dismall Cloud of Sea-coale" which produced an impure mist and a fuliginous and filthy vapour, which affected the inhabitants to such an extent that "Catharrs, Phthisicks, Coughs and Consumptions rage more in this one City than in the whole Earth besides".

Smoke nuisance grew progressively more serious with the passage of time as manufactories became larger and more industrialised in their processes. In 1819 a Select Committee of the House of Commons was appointed to enquire "how far it may be practicable to compel persons using steamengines and furnaces in their different works to erect them in a manner less prejudicial to public health and public comfort". New modes of transport created further problems as sailing ships on the Thames were replaced by steam vessels and the first railway lines and railway termini were built within the City. Furthermore, for the whole of the first half of the nineteenth century, overcrowding in the City was at its worst. The residential population during this time did not fall below 121,000 and reached nearly 130,000 in 1851.

Further Select Committees of the House of Commons were appointed in 1843 and 1845 but meanwhile, on 29th October 1840, the Common Council of the City of London had directed its General Purposes Committee "to inquire into the annoyance and nuisance to which the

inhabitants of this City are subject from the smoke of manufactories and steam engines, and also from steam boats on the river Thames, and the best means of obviating the same". The Committee advertised for suggestions as to methods of suppressing smoke nuisance and received many replies which it analysed in its report presented to the Common Council on 14th October 1841. As a result of this report petitions were presented to both Houses of Parliament for legislation to be enacted to suppress smoke nuisance, and copies of the Committee's report were sent to all the large manufacturing towns. Further petitions to Parliament were made in 1847 and 1849. In 1850 a report by the City's first Medical Officer of Health, John Simon, listed some of the injuries caused by smoke: (1) the damage caused to property by dirt and corrosion (2) the expense, caused by increased washing, to "the washing part of the population" which he described as a heavy annual tax on persons using clean linen (3) the indirect danger to health, intensified in times of sickness, which was brought about by a general reluctance to open the windows of dwelling houses sufficiently for the purposes of ventilation and (4) the direct danger to health from the irritation caused to the respiratory organs. In Simon's and the Corporation's view the Smoke Prohibition Bill which came before Parliament in 1849 did not go far enough. Efforts were made to amend it by extending its application, firstly, to the furnaces of all manufactories and not only the furnaces of steam engines, and, secondly, to the whole of the Metropolis and to steam boats on the river Thames. Success was obtained on the first count but not on the second. Section 48 of the City of London Sewers Act, 1851 (14 & 15 Vict. c. 91), in which these provisions were incorporated, applied only to trades and manufactures within the City. It enacted that "every Furnace . . . shall in all Cases be constructed or altered so as to consume the Smoke arising from such Furnace". The Commissioners of Sewers for the City, who were appointed by the Common Council and whose functions were transferred to the Corporation in 1897, were the local authority under this Act. In 1852 the Court of Common Council petitioned Parliament again for an extension of similar provisions to the Metropolis and to steam boats and in 1853 the Smoke Nuisance/Abatement (Metropolis) Act (16 & 17 Vict. c. 128) was passed. This, with an amending Act in 1856 (19 & 20 Vict. c. 107), covered the whole of the Metropolis and applied to steam boats on the river both above and below London Bridge to the Nore.

Opaque smoke from coal burning furnaces arose in large measure from the imperfect combustion of the fuel, and the above legislation was directed towards the elimination of this particular cause of the nuisance. In 1853 complaints against Messrs. Calverts' Brewery and the City Flour Mills, both in Upper Thames Street, caused William Hayward, Surveyor to the City Commissioners of Sewers, to lay a report before them on the consumption of opaque smoke. Observations kept daily on the brewery chimneys for a period of a week and recorded at ten-minute intervals showed that on 444 out of 1,671 occasions the shafts were emitting either exceedingly dense or rather dense smoke. In Hayward's view it was practicable to prevent almost entirely the issue of opaque smoke from furnace shafts and he instanced the brewery of Messrs. Truman, Hanbury, Buxton and Co. in Brick Lane, Spitalfields, as an admirable example of smoke prevention. At the same time the Corporation was setting its own house in order; in 1853 it entered into a contract with Mr. John Lee Saunders, a civil engineer, to erect a smokeless furnace as patented by him for preventing or consuming the smoke arising from the boiler and engine at Billingsgate Market.

The Sanitary Act of 1866, sec. 19 (29 & 30 Vict. c. 90) increased the powers of the local authority to deal with nuisances, and under this and the former Acts the suppression of smoke nuisances in the City and on the Thames continued. A Bill to exempt bakers' ovens from the Smoke Nuisance Abatement (Metropolis) Act of 1853 was successfully opposed by the Commissioners of Sewers in 1872.

In 1872 the Corporation became the Port of London Sanitary (later Health) Authority.

Further legislation was under consideration in 1884-90. The Lord Mayor presided at a meeting held at the Mansion House on 16th July 1884 under the auspices of the National Smoke Abatement Institution. In the opinion of the Institution, this meeting was instrumental in securing the second reading of the Bill then before the House of Lords. In 1887 the City's Medical Officer of Health, William Sedgwick Saunders, welcomed the proposed legislation because it would give the Commissioners power to deal with the nuisance caused by unconsumed smoke from restaurants, taverns and clubs. However, the efforts of the City and others were unavailing, and in 1890 the Sanitary Committee reported to the Commissioners, "for years past Bills have been introduced into Parliament with the object of extending the powers of Local Authority . . . but have failed to pass into law". The Public Health (London) Act, 1891 (54 & 55 Vict. c. 76) conferred no greater powers on local authorities, and objection was made to it in a report of the Sanitary Committee of December 1891 on the ground that convictions could not then be obtained in relation to domestic fireplaces and that the difficulty would be more particularly emphasised under the new Act as the chimneys of private dwellinghouses were specially exempted. In succeeding years the Corporation supported efforts to end the limitations in the Act of 1891 both as regards private dwellings and as to prosecutions only being possible in cases of emission of "black" smoke.

The Public Health (Smoke Abatement) Act, 1926 (16 & 17 Geo. V c. 43) removed the latter limitation, although in case of the emission of smoke other than black smoke a defence could be pleaded that the best practicable means for preventing the nuisance had been used. This Act increased substantially the penalties on conviction for smoke nuisance and gave power to local authorities to make byelaws regulating the emission of smoke. The Common Council was the local authority within the City and in its capacity as the port sanitary authority within the Port of London also. Much of this Act was repealed and replaced by the Public Health (London) Act, 1936, section 151 of which governed the Common Council's power to make byelaws for regulating the emission of smoke. The chimneys of private dwellings were still exempted from control under this Act but so far as the City was concerned the decline in the residential population made this a problem of decreasing importance. However, the enormous number of individual offices burning coal in fireplaces entirely discounted this advantage.

The matter of smoke control was not forgotten during the war of 1939-45. At a meeting on 5th November 1943 the National Smoke Abatement Society adopted certain resolutions for submission to the Government and to local authorities. The Government was urged to give the problem of atmospheric pollution urgent and full attention, with especial reference to new housing schemes, new installations for the production of power, electrification of the railways, increased production of smokeless fuel and

the establishment of smokeless zones in towns. Local authorities were urged to form smoke abatement committees. As a result the Public Health Committee of the Corporation appointed a special sub-committee which on 23rd May 1944 considered a long report from the Medical Officer of Health, Charles F. White, on "Measures for the Prevention of Smoke in relation to Initial Post-War Reconstruction". Previous legislation, as has been seen, had been directed largely against smoke from industrial premises. In the City, the Medical Officer pointed out, the main problem was now commercial premises in which smoke was produced from plants for central heating and the supply of water and also from open fires in individual rooms. He illustrated this by reference to the view from his own office window from whence "every morning when fires are lighted I see individual columns of smoke rising from many of the chimnies and uniting to form a little cloud over Coleman Street".

As a result of the recommendations in this report, the Corporation determined to seek statutory powers in its next Various Powers Bill, (1) to acquire a measure of control over arrangements for generating heat or power in new buildings in the City and over alterations to existing arrangements, and (2) to declare any area of the City a smokeless zone. In the face of strong opposition the latter proposal had to be abandoned, but section 14 of the City of London (Various Powers) Act, 1946 exten-

ded the powers of the Common Council to make byelaws under section 151 of the Public Health (London) Act 1936 to include byelaws concerning heating arrangements in new buildings and alterations to heating arrangements in existing buildings. In the event, however, it proved impossible to frame satisfactory byelaws.

In the immediate post-war period the City was very anxious to press on with measures for smoke abatement, both on its own and in conjunction with other interested bodies. In 1946 the Corporation became a local authority member of the National Smoke Abatement Society. The first representatives were Sir George Elliston, then Chairman of the Public Health Committee, Mr. W. J. Taylor and Mr. W. N. Bacon, together with the Medical Officer of Health and the City Engineer, Sir George Elliston was later to serve as President of the Society. In 1947 the Corporation renewed its subscription to the Greater London Advisory Council for Smoke Abatement which was resuming its activities after the war. On its own account the Corporation in 1948 submitted two sets of draft byelaws to the Minister of Health for informal approval. The first set, to be made under the Public Health Act (London) 1936, sec. 151(i), related to the emission of black smoke. These the Minister refused to approve, despite many discussions between the City officers and Ministry officials, because of the difficult coal supply position at that time and the shortage of smokeless fuels. The same objections applied to the second set of



*London Street—1923*

draft byelaws, to be made under the Public Health Act (London) 1936, sec. 151(iv) as extended by the City of London (Various Powers) Act 1946, which related to new heating plants or alterations to existing plants in the City, but in this case there was a further obstacle. This was the difficulty of framing byelaws which should be specific enough to leave no reasonable doubt as to the conditions to be complied with and yet comprehensive enough to cover all makes of suitable installations, including designs not yet on the market. Discussions continued over a long period between the City and the Ministry but meanwhile a measure of control over new plants was exercised under the Town and Country Planning Act, 1947, and through the suggestions and supervision which the City Engineer and City Planning Officer were able to give during negotiations with developers. Attempts were also made during 1946 to 1949 to devise a system of district heating for the areas of the City which were to be rebuilt, including the possibility of waste heat from Bankside power station, but these proved unsuccessful.

A new and dreadful impetus was given to the demand for greater smoke control by the Central London "smog" of December 1952 which caused over 4,000 deaths, particularly among the old and the very young and those suffering from respiratory and cardiac diseases. The Government appointed a Committee on Air Pollution under the chairmanship of Sir Hugh Beaver whose recommendations were to lead to the Clean Air Act of 1956. The Corporation, however, anticipated national legislation and determined towards the end of 1953 to seek powers to designate the whole of the City as a smokeless zone. By the City of London (Various Powers) Act, 1954, which became effective from 2nd October 1955, the Corporation became the first local authority in Europe and the Commonwealth to designate its whole area a smokeless zone.

The effects of this Act soon became apparent in the cleaner air over the City, which benefited not only the City but adjoining areas. The City's powers under its own legislation were supplemented by powers under the Clean Air Act, 1956, to take action in respect of smoke from railway engines which had been excluded from the Act of 1954. Those powers became effective in 1958 but the Corporation had already been in negotiation with British Railways for the replacement of steam engines within the City by diesel engines. In 1957 the banker engine at Smithfield and Holborn and Ludgate Circus had been replaced by a diesel engine, a smoke control inspectorate had been set up at Liverpool Street Station, and arrangements had been entered into with the Eastern Region of British Railways for an education programme for footplatemen. The Corporation was a strong advocate of a positive programme of education, persuasion and co-operation wherever possible, and also of research into the basic causes of air pollution. In the years prior to the enactment of its own legislation the Corporation had carried out investigations in conjunction with the Department of Scientific and Industrial Research to establish the necessary background data for such legislation. In July 1955, shortly before the City of London (Various Powers) Act, 1954, came into operation, a Smokeless Zone Exhibition and Advisory Centre was set up for two weeks near St. Paul's Cathedral, primarily to advise City firms and residents but which stimulated interest over a wider area than the City through the attendance of many commuters.

The same positive approach was adopted by the Corporation as the port health authority. Smoke control in the Port of London presented very great problems,



*London Policemen were issued with smog masks during a fog in 1956*

partly due to roughly 45,000,000 tons of shipping from all over the world annually entering the port. The sources of smoke comprised a large number and variety of ships, harbour craft, shore installations, locomotives and cranes using steam boilers or auxiliary steam boilers; these were spread out over a very narrow area some seventy miles in length, and most of them being mobile, were difficult to locate and control. Smoke emission from ships was specifically mentioned in the Beaver Report as a contribution to atmospheric pollution, and in 1956, after the passing of the Clean Air Act, the Inspectors of the Port of London Health Authority carried out a survey which proved that certain types of vessels, notably coal burning coastal colliers, coal burning tugs and coal burning harbour craft, were especially liable to emit dark smoke. Many of the eighteen Port Health Inspectors often instructed the stokers in the most satisfactory method of working. A more detailed survey was then made of these types of vessel, and experiments were carried out in conjunction with the Fuel Research Station at Greenwich into methods of firing, types of fuel and related problems. As a result new techniques were evolved by which the emission of dark smoke was considerably decreased without any reduction in boiler output or efficiency. In these circumstances it was possible for an approach to be made to the shipowners, most of whom proved co-operative; a programme of replacement of coal fired tugs by diesel engined tugs was begun, many smoke reducing devices were fitted and more suitable fuels selected. Letters were sent to the Consuls General of countries whose ships visited the Port of London on the operation of the Dark Smoke (Permitted Periods) (Vessels) Regulations, 1958, which were made under the Clean Air Act, 1956; and representations were made to the Ministry of Transport and Civil Aviation that the curriculum for engine room officers should include information about the Clean Air Act.

Until 1954 the City's efforts, as those of all bodies concerned with air pollution and of all legislation, had been directed towards the reduction of smoke nuisance. Now other aspects of atmospheric pollution, especially sulphur pollution, became the subject of great concern, and emphasis was placed on clean air in a wider sense than smoke abatement. The Corporation continued to co-operate with other interested organisations. In 1956 it agreed to support the representations made by the Metropolitan Standing Joint Committee to the Government with regard to pollution caused by diesel engined buses and petrol driven vehicles. Receptions at Guildhall were given for delegates attending the International Clean Air Conference of 1959 and the International Clean Air Congress of 1966. The Corporation continued to be a staunch supporter of the work of the National Society for Smoke Abatement which was renamed the National Society for Clean Air in 1958. In 1954, on the death of Sir George Elliston, Mr. Stanley Cohen, then Chairman of the Public Health Committee took his place as a Corporation representative. Mr. Cohen was Honorary Treasurer of the Society for fourteen years from 1957-71 and held office as its President for two years in succession, 1971-72 and 1972-73. In 1960, Mr. Cohen was invited by the Minister of Housing and Local Government to become a member of the Clean Air Council and by successive invitations every three years he has served on that body ever since. There can be no doubt that the Corporation's policies towards clean air owe much to Mr. Cohen's initiative since 1953 and to the prominent part he has played in this and as the Corporation's representative on

outside organisations both national and international. In 1963 a memorandum prepared by Mr. Cohen on the need to revise the Dark Smoke (Permitted Periods) (Vessels) Regulations of 1958 and another prepared by the Medical Officer of Health and the City Engineer on sulphur pollution were circulated by the London and Home Counties Clean Air Advisory Council to its members. At all times the City has co-operated with neighbouring authorities concerning premises which straddle the City boundary. The City of London (Various Powers) Act, 1960, section 32 extended the powers of the Act of 1954 to provide that such premises should be treated for smoke control purposes as being wholly within the City or wholly within the neighbouring Borough by agreement between the two authorities.

From the middle of the 1950s, atmospheric pollution by sulphur became a matter of great concern in the City of London, where a high concentration of office premises heated by means of oil fuels with a high sulphur content presented special difficulties. In 1956 the Cathedral authorities expressed anxiety as to the effects on the fabric of St. Paul's of sulphur emission from premises in the City and from the Bankside Power Station, and held discussions with the Corporation. Concern was also felt by many people about the danger to health and to property by sulphur pollution. The problem was liable to grow worse as the war damaged areas of the City were redeveloped and every effort was made by the City officers to persuade and advise developers to use fuels of low sulphur content. In this they were helped by the



*The effect of Clean Air on the City of London*

requirement of the Clean Air Act, 1956, that notice of intention to install new furnaces must be given to the local authority, and by the powers in the City's own legislation of 1954 concerning conditional approvals for authorised fuels and approved furnaces. The system of conditional approvals under the Act, however, was a voluntary and not a mandatory one.

At the end of 1958 the Port and City of London Health Committee appointed an Air Pollution Sub-Committee which considered reports from the officers and a memorandum prepared by Mr. Stanley Cohen on the need for reduction of sulphur pollution. As a result it was resolved that conditional approvals should only be given to oil heating systems using oils of a low viscosity which emit less sulphur dioxide. Valuable as this step was, its effectiveness was limited by the voluntary nature of the system of conditional approvals. Efforts to persuade the oil distributors to recommend the use of fuels with a low sulphur content were unsuccessful. Statistics for 1958-60, based on a country-wide monitoring system, showed the City to be among the six places with the highest concentrations of sulphur dioxide, as distinct from smoke, in the country, and the perils of this situation were emphasised by the London "smog" of 1962. This led to demands for amendment of the Clean Air Act, 1956, to restrict the use of fuel oils to those of lighter viscosity. But as in 1948 attempts at better smoke control had been frustrated by the shortage of smokeless fuels, so now attempts to reduce atmospheric pollution by sulphur were hampered by a shortage of lighter oils for industry. The Corporation made an important contribution to clean air in the City when it decided that the extensive Barbican development should be heated by means of electricity, and in the course of the 1960s many other Corporation premises were converted to use gas oil. During the construction of the Tower Blocks in Barbican, when workmen complained of fumes from lower chimneys, investigations were undertaken in consultation with the Air Pollution Unit at St. Bartholomew's Hospital which proved by means of a new sampling apparatus devised by the Unit that eddies of only a few seconds duration could provide high concentrations of sulphur dioxide.

Some advance was made by the Clean Air Act, 1968, which extended and adapted a number of the provisions of the Clean Air Act, 1956. This attacked sulphur pollution by reducing ground level concentration by control of the height of chimneys, a solution that is reminiscent of some early efforts at smoke control. Section 6 of the Act has made it compulsory for the approval of the local authority to be obtained for the height of chimneys in the case both of new furnace chimneys or when the capacity of an existing furnace is to be increased. The Clean Air (Height of Chimneys) (Prescribed Form) Regulations, 1969, which were made under the Act, came into operation on 1 April 1969.

The Act, however, contained no direct provisions against the emission of sulphur. The Corporation took the view that the control of emission of sulphur gases at

source was the right approach and that the concentration in the City, which despite a welcome downward trend was still very high, could be much reduced if powers could be obtained to require all new furnaces installed in the City to use fuels of a low sulphur content. Once again, as in 1954, the Corporation decided on Mr. Cohen's proposal to promote its own private legislation and clauses relating to the burning of sulphurous fuels were included in the next City of London (Various Powers) Bill to be laid before Parliament. These clauses were more strongly opposed than had been the proposals to create a smokeless zone in 1954, but on 5th August 1971 the Bill received the Royal Assent. The provisions of the Act, which make the burning of sulphurous fuel an offence within the City, apply to all new furnaces with effect from 1st January 1972 and to all furnaces throughout the City with effect from 1st January 1987. The term "sulphurous fuel" was not defined in the Act itself but was to be determined by resolution of the Court of Common Council. As a result a restriction has been placed on the use within the City of fuel oils containing more than 1% weight of sulphur and sulphur compounds. The City of London (Various Powers) Act, 1971, is the first parliamentary legislation in this country to make provision for the limitation of the sulphur content of fuel.

The Act also included an amendment to the Act of 1954 to provide that the prohibition of the emission of smoke from "premises" in the City should apply equally to that from any land or buildings. This extension was obtained in order to overcome the difficulty of controlling smoke from bonfires on demolition sites.

The benefits of a reduction in air pollution scarcely need stating. They include fewer deaths and fewer hospital admissions among sufferers from respiratory and cardiac diseases; a substantial increase in winter sunshine and a decrease in the frequency of polluted fog; improved visibility; a greater variety of plant and bird life; and a much more pleasant City in which to live and work. The Corporation's measures to prohibit smoke nuisance and, more recently, the burning of sulphurous fuel, and its co-operation with other London authorities and with national and regional organisations, have contributed to these ends to the benefit not only of the City but of Greater London. The City of London (Various Powers) Act, 1971 may be a milestone in the history of clean air in the City but it is certainly not a resting place. Constant vigilance will be needed to ensure the effectiveness and possibly the improvement of smoke and sulphur control. And there are other threats to clean air. Already a survey has been carried out by the National Society for Clean Air, in conjunction with the Corporation, to determine the constituents of exhaust gases of vehicles passing through the City streets, and it is worth recording that H.M. Government have recently issued regulations, in conjunction with the European Economic Community, limiting carbon monoxide emissions from new petrol driven vehicles, the recycling of crank-case gases and stricter controls to prevent smoke emissions from diesel operated vehicles.

# BOOK REVIEWS

## **Annual Report of the Scientific Adviser 1972** *Greater London Council £4.00 (postage extra)*

As ever, this is a very well presented, clearly written exposition of the work of the Scientific Branch of the Greater London Council. It contains a mass of information and shows just how much is being done every day to protect and improve the lives of the vast number of people who live in the Greater London Area. One wonders how many of such people know of the work of the Scientific Branch and can only be sure that they are all too few. Nevertheless, we suggest that all those who can obtain the Report—we are sure that it will be readily available in all London libraries—should do so.

The Report follows the pattern established in previous years and it is in six main parts: water pollution control and refuse analysis, building sciences and material sciences, environmental studies, statutory, general supplies and services and general. It is interesting that water pollution and refuse disposal form a section on their own and are not included as part of the environmental studies. Doubtless the Scientific Branch of the G.L.C. have a good reason for presenting the Report in this way but it does seem to us that water pollution control and refuse disposal are very much an environmental concern and could well form a part of the section headed "Environmental Studies".

In the section on air pollution the Report makes the point that visitors to London during the winter of 1972 would have found it difficult to envisage the conditions not many years before in which some Central London cinemas had to discontinue performances because of smog. The Report, however, continues: "With the achievement of such improvement, there is a danger that it might be felt that there is little more to do. But it must be remembered that there have been a number of important changes in the situation since the 1956 Clean Air Act was passed, such as: The change in public attitudes and expectations in relation to pollution; a shift in the relative concentrations of pollutants as a result of the large increase in road traffic; evidence indicating possible hazards from substances previously disregarded as air pollutants as well as a greater appreciation of the need to take count of their effect on specific sectors of the population". It is against this background that the work of the Scientific Branch continued in 1972, and there is some interesting information in this Report about industrial emissions and vehicle emissions. So far as smoke measurements are concerned, the Report comments that it is notable that the smoke measurement has shown little change in the period since 1968 following the rapid decline from the very high levels in the 1950s, but it is not yet clear whether there is a similar trend towards a fairly constant value for sulphur dioxide, although the graph showing the annual averages of sulphur dioxide at ground

level for seven Inner London sites continues to show a downward trend.

The Report draws attention to the importance which the public now attaches to dust and says that this was substantiated by the social surveys which were carried out as part of the G.L.C. Motorways Environmental Reinstatement Pilot Study. This showed that dust is ranked as high as noise as a factor affecting amenity. The Report points out that there are many difficulties in the investigation of the impact of "dust" and "grit" on amenity. "The terminology used is not specific and no clear dividing line between dust and grit has been universally agreed. Sometimes the issue is further confused by the use of the term "dirt". Care must be taken to establish what property of the airborne material is thought to be important, its physical obtrusiveness, its soiling power and so on, as a basis both for developing an acceptable terminology and for devising suitable collection and examination techniques".

The Report then deals with metals in the atmosphere and comments that there is relatively little information on their occurrence although in certain cases where it was believed that a specific problem needed investigation, very detailed surveys were carried out. Speaking of lead, the Report says "It would be advantageous if some generally applicable techniques and acceptance levels could be established but it seems, to judge from the information presented at an International Conference held in Holland in 1972, that this will not come about for some time . . . The Conference was faced with the dilemma which exists generally in pollution control, that is, whether to adopt the attitude that any measurable quantities of a toxic substance should be regarded as adverse from a health point of view until the contrary is proved, or alternatively to take no action until clinical evidence has been assembled to show that any particular pollution level does lead to a significant effect with regard to health".

Noise apparently is no new problem, and the Report states that there are accounts dating back to the Middle Ages of people placing straw on the streets near their homes to deaden the sound of horses' hooves and carriage wheels. Yet it is only comparatively recently that there has been any systematic investigation of noise pollution. "In 1960 in conjunction with the Building Research Station, the Scientific Branch undertook the London Noise Survey, which was the first investigation of its type carried out anywhere in the world. Since then, the demands on the Branch for investigations into the various aspects of noise and acoustics have grown in number and complexity." The Report explains some of the difficulties experienced in measurement of noise and says "It is paradoxical that noise is one of the areas where the greatest difficulty exists in explaining, in terms which can

be readily grasped, the implications of the noise levels measured in the various surveys carried out". The Report then gives tables which it is hoped will be useful in indicating the nature of decibels and the noise levels of some typical situations.

Specific surveys of traffic noise have been carried out and some of the results make very interesting reading. For example, it had been expected that there would be a substantial reduction in traffic noises in Oxford Street which, it will be remembered, was closed to traffic other than buses and taxis. The results obtained, however, indicated a relatively small decrease of the order of two or three dB(A). This was possibly accounted for by the fact that buses are among the noisier types of vehicles and that these are very frequent in Oxford Street. At the same time, in the streets taking the diverted traffic from Oxford Street, little change in noise level was found although traffic volumes had increased.

Aircraft noise, railways noise, industrial noise and vibration are all dealt with.

The other sections of the Report are equally comprehensive. It is a book that is well worth reading, a book which is written in language which the layman can understand. For those members who have not other access, the Report may be borrowed from the Society's library.

Reader Enquiry Service No. 744

#### **Extract from Report on the Health of the City of Manchester 1972**

*Kennedy Campbell, Medical Officer of Health*

This extract from the report on all aspects of public health in Manchester contains interesting sections on air pollution and noise control in the City.

The most important single component of air pollution in Manchester is domestic smoke and this has been dramatically reduced by the establishment of smoke control areas, which now affect 75.4% of the City's total area of 42.5 square miles. Several maps and tables illustrating this improvement are given in the report.

Manchester, already affected by vehicle congestion can expect some of the projected increase in urban traffic load and with it the associated additional air pollution. Accordingly, it appears probable that by the time the smoke control programme is completed the most serious single component of air pollution in the City could be air pollution from motor vehicles.

During 1972 the department received and investigated 242 complaints of noise nuisance, 50 of which were from industrial sources, compared with 211 in the previous year. The report points out that although the question of nuisance is a subjective matter, measurement is necessary as a precursor to action to remedy. The methods of B.S.4142 are used where appropriate, but not as a means of imposing a simple, arbitrary, decision in any particular case. Often the most difficult feature of abatement is to convince the offender that the nuisance exists; some remain unconvinced even after the service of notice under the Noise Abatement Act, 1960.

In his introduction to the report Mr. Foskett, Chief Public Health Inspector, says that public concern with regard to environmental pollution has continued during

the year although attempts to stimulate interest are not always completely objective and some have been based on desires to sensationalise a particular aspect. He feels that the department is active in attempting to deal with existing sources of pollution, endeavours to ensure that new developments will not cause offence and is constantly vigilant with regard to future sources of pollution.

Reader Enquiry Service No. 745

#### **Industrial Air Pollution Control**

*Edited by Kenneth E. Noll and Joseph R. Duncan. Ann Arbor Science Publishers Inc. 350 pages, April 1973*

The information gathered in this book was first presented at an air pollution control conference at Knoxville, Tennessee, U.S.A. It is the work of two editors and thirty-four authors, grouped in five sections, and includes twenty-nine chapters. The authors come from ten of the States and base their experiences, practices and literature on Tennessee (8), Alabama (5), Ohio (4), Pennsylvania (4), North Carolina (2), and one each from Colorado, Maryland, Mississippi, New York and Indiana.

The combined populations of those States amount to upwards of sixty millions, more people than there are in the U.K., and their combined areas amount to five times the land area of the U.K.

Britain's average air pollution problems were greater at first than those in the U.S.A., before North America developed its present vast conurbations in its eastern States and more recently in its far west. In these relatively congested areas it is now all too obvious that air pollution arises from people, from human activities.

It seems a pity therefore that this book ignores, or at least does not draw attention to the success achieved by by the British Clean Air Acts, the British National Survey of Air Pollution, and the cleaning up of the previously most grimy work areas and cities in Britain.

It was a very small minority of the people in the U.S.A. that caused the birth of their Smoke Abatement Movement in the 1880s. But by 1907 enough people were concerned with smoke abatement in the U.S.A. to allow the formation of their Smoke Prevention Association, mainly composed of railroad and municipal smoke inspectors.

Now there is no longer pride in clouds of black smoke billowing from chimneys, as proof of gainful employment, and any visible emission of smoke has become a pointer to inefficiency in burning precious fuel. Meanwhile the 1907 Association has changed its name to the Air Pollution Control Association, and its membership now consists mainly of engineers, scientists, and other professional persons.

The Coal Smoke Abatement Society that was formed in the U.K. in 1899 also later changed its name to the National Society for Clean Air, in 1958. This new book therefore invites some comparison of experiences and endeavours in these two industrial nations that share the same language.

In 1800 A.D. the U.K. population was twice as numerous as that of the U.S.A. By 1875 about 30 million people lived in the 93 thousand square miles of the U.K. whereas the U.S.A. population had grown to about 45 millions inhabiting 3600 thousand square miles. So when

a U.K. square mile held 322 people, a U.S.A. square mile held only 1.2 people. That was the year in which the U.K. Public Health Act laid the foundation for much present-day clean air legislation.

The population density in the U.K. is now ten times that of the U.S.A., a square mile supporting 590 people in the U.K. and only 58 in the U.S.A.

**Scope:** By noting that the chapters in the successive Sections cover Power Generation, Metallurgical Processes, Raw Material Processing, and Chemical and Wood Products Industries, one may appreciate the very wide scope of this practical and useful book. Its production is fully justified by Professor Arthur C. Stern's five-page introduction to Section 1. His admirable word picture depicts the social, political, and technological aspects of industrial air pollution, and outlines the present status and trends in the U.S.A.'s industrial air pollution control.

**References:** Half of the many authors give no references at the end of their chapters. The others conclude their chapters with 45 references in Section 1; 37 by W. B. Harrison after his long chapter on Power Generation and the Environment, in Section 2; and 20, 12, and 14 in the last three Sections.

But the Editors have included a surprisingly long list of General References, that reaches from page 311 to page 337, and deserves noting by research workers. These General References are grouped to match the subjects of the five Sections of the book. Those grouped for Sections 1 and 2 are subdivided under the following headings: Air Resource Management, Dispersion and Diffusion, Air Pollution Standards, Air Monitoring and Source Sampling, Urban Planning, Combustion and Power Generation.

**Index:** The book's six page Index is really quite inadequate, with so many diverse aspects covered in the text. Alan Gilpin's "Control of Air Pollution", Butterworths, London, 1963, that started with a Foreword by Sir Hugh Beaver, ended with a splendid 19 page index.

Gilpin's textbook dealt with the practical application of the British Clean Air Act of 1956, and made many references to Britain's century old Alkali Inspectorate and legislation. That one-man-author British old-masterpiece of 514 pages is not even listed in the references of this new American book.

**Conclusion:** Environmental Officers and students of air pollution control should not ignore what is now being done in the U.S.A., so this book may help them. But as it has no large print, page Index of the various specialist's gobbledegook, readers should insert a stiff sheet of paper on which to make their own index of the meaning of A.E.C., L.M.F.B.R., L.N.G., S.N.G., M.H.D., etc.

In fairness to the consumers, who pay for such publications, readers trained in disciplines other than that of any author, every contraction should be clearly indexed and explained by the printer.

*T. Henry Turner*

Reader Enquiry Service No. 746

## **Battery Truck Book**

### *Lead Development Association*

A new "LDA BATTERY TRUCK BOOK" gives the user advice on choosing the right truck, battery and charger and how he can best take advantage of them. It explains the modern philosophy of using lead batteries to power electric trucks and other vehicles and highlights the developments of recent years. Electrics are faster than they were five years ago and can be worked harder between charges. They can do the heavy work previously done by diesel and LPG trucks, but without the fumes and noise which are so annoying in factories. A cost comparison shows that electrics are the cheapest to run and this offsets their slightly higher first cost.

The book provides the new user with all information needed in going electric. Diagrams show the range of speeds and the varying work capacities of today's trucks and permit users to check that the lead battery will have more than enough energy for the job in hand.

The book will also be of value to current users of battery electrics with its practical information on such topics as automatic chargers, boost charging and intensive usage.

All recommendations are in accordance with current practice and were drawn up by the Lead Development Association in consultation with British battery and truck makers.

Reader Enquiry Service No. 747

## **HM Chief Inspector of Factories Annual Report 1972**

### *HMSO*

The Report is set out in six sections: 1. Industrial Hazards 2. Lead 3. The Construction Industry 4. Safety and Health Activities 5. Environmental Hygiene and 6. Accident Experience, with Appendices and Tables.

The Chief Inspector of Factories, Mr. Brian Harvey, warns managers in industry that they must improve safety organisation. In his introduction to the Report he says that he is not simply trying to exhort managers to improve their safety performance, but he is serving notice on them that the Inspectorate will be concentrating more and more on their deficiencies in the area of safety organisation, training and supervision and less on the symptoms of their failure. He stresses that if all managements could be persuaded to raise their safety performance only a little nearer that of the companies with the best records the national accident figure would decline dramatically.

During 1972 the Factory Inspectorate started to give more time, on an experimental basis, to firms with large numbers of employees; firms where risks were high; or where management was ineffective in coping with its problems. Results were encouraging and the experiment was continued in 1973.

There was an increased demand for industrial hygiene services in 1972. The Report points out that with rapid technological change in industry there is a need for the evaluation of possible long-term hazards. The Industrial Hygiene Unit dealt with a wide range of substances during 1972 often taking samples over a long period in order to get a better assessment of risk to workers. In addition, Factory Inspectors have been equipped with instruments for the first time to take samples of asbestos

and lead in the air and have made increasing use of other instruments during inspections. The Inspectorate is currently spending £170,000 to re-equip inspectors in the field with instruments which will enable each of them to have his own basic environmental testing kit.

An ever-present problem in industry, which has defied control for over a century, is industrial dust. The dust risk is high in a few industries—those using silica and those using metals like lead, minerals like asbestos and fibres such as cotton. Expensive and sophisticated equipment is often required to control dust and regular monitoring of the atmosphere is essential to maintain satisfactory control. But, as Mr. Harvey emphasises in the report, the reward in human terms is clearly established as the complete control of dust in industry could conceivably extend the life-span of many workers by up to ten years.

The work being done by the Inspectorate into the health hazards caused by lead processes is of sufficient importance to merit a separate chapter in this report. Whilst there has been only one reported death from lead in twenty years, there has been a good deal of public concern about how far the risk to health may extend outside the factory. As this aspect is outside the immediate concern of the Inspectorate, they have been working closely with other government departments and local authorities to reduce lead pollution.

In conclusion Mr. Harvey says that the ordinary worker is now more vocal in demanding improvements in health and safety in working conditions than ever before. He is demanding improvements which the Inspectorate have been trying to teach him to want for a hundred years. Mr. Harvey says that the Inspectorate are thankful for this as public interest, and criticism, of their work is an enormous stimulus for them to do better and to improve their skills in the interest of those whose protection is their concern.

Reader Enquiry Service No. 748

#### **County Borough of West Bromwich, Hygiene and Cleansing Dept., Annual Report 1972** *HMSO*

The Report deals with a number of subjects relating to public health including housing, air pollution, noise control, factories, food and drugs, meat hygiene, special services, cleansing and salvage.

In the section on industrial air pollution the Report states that in the West Bromwich area emphasis is gradually moving away from smoke and visible emissions, towards the elimination or reduction of grit and dust emissions, odours and the invisible pollutants. The need for routine inspections of the district to discover smoking chimneys has completely disappeared. Equipment to measure grit and dust burdens in chimneys was on order at the end of 1972.

With regard to the measurement of metals in the atmosphere, there has been difficulty in obtaining reliable, up-to-date information that could be used in comparison to the heavily industrialised area of West Bromwich. However, other Midland Authorities are carrying out measurements and Warren Spring Laboratory (Department of Trade and Industry) intend doing some measurements on selected industrial sites in the Midlands during 1973, so reliable comparative results should be available shortly. Meanwhile, investigations are being carried out at various industrial premises and a table showing results taken at four sites is given in the Report.

In the section on Traffic Noise there is a table showing results obtained at nine different sites adjoining urban roads in the Borough. The results on average were much higher than anticipated and show that there are numerous existing householders subjected to traffic noise levels well in excess of accepted criteria. The Report reiterates several suggestions made in the Department of the Environment White Paper "Development and Compensation—Putting People First" and the Urban Motorways Committee Report "New Roads in Towns"—among them the provision of barriers and mounds at the planning and construction stage of new roads and the purchase of affected properties by agreement.

Reader Enquiry Service No. 749

#### **The Geography of Pollution—A Study of Greater Manchester**

*C. M. Wood, N. Lee, J. A. Luker, P. J. W. Saunders, Pollution Research Unit, University of Manchester. Manchester University Press, £2.00*

This study is written by four people—Mr. Christopher Wood (Planner), Dr. Norman Lee (Economist), Mrs. Alison Luker (Economist) and Mr. Peter Saunders (Biologist). It is intended for three types of reader: the general reader, who will find the book readable, with a minimum of technical terminology; the people involved professionally in pollution control; the academic specialist who is anxious to gain a wider understanding of environmental pollution.

It is the first comprehensive survey of all forms of pollution—air, land, water and noise—within a large conurbation. The area covered, town by town, is Greater Manchester, although the analysis and the conclusions reached are highly relevant to the control of pollution, elsewhere in Britain and abroad. The survey defines the black spots, producing a "league table" of local authorities (worst first)—Salford, Wigan, Manchester, Rochdale, Bury, Stockport, Oldham and Bolton. It also proposes a unified system of pollution control, which could, for example, predict the impact on the environment of major policy decisions, such as airport development, housing schemes, hypermarkets, industrial estates and so on.

The survey is the result of three years' work by a team of experts from Manchester University's Pollution Research Unit. Their brief was to carry out the first comprehensive analysis in Britain of one particular area. The project has been supported by substantial grants from the Social Science and Science Research Councils and Lancashire County Council. They chose Greater Manchester, which, as a highly industrialised and densely populated sub-region of North West England and probably one of the most highly polluted areas of the country, presented all the problems likely to occur anywhere.

The study highlights the fact that the major black spots are mainly in lower-income, disadvantaged areas, which may also be suffering poorer quality housing, education and general amenities. It shows too that the disadvantaged groups are less likely to complain. Speculating, on their evidence, for the future they foresee these disadvantaged, high pollution, areas gradually easing off the burden, if only by shifting it to the "outer areas". Reductions in smoke and sulphur dioxide concentrations and improvement in river quality are the sort of factors that must eventually improve the lot of the disadvantaged areas and, indeed, the area in general. Other problems, like the increase in traffic densities and the exhaustion of solid waste disposal capacities, may only be "solved" by being handed on to the less-polluted places.

What the experts call for is a more unified approach to pollution control, particularly within the disadvantaged areas. Under the local government and river authority re-organisation the number of control bodies for different pollutants will be considerably reduced, but, even so, a unified control system is not provided. The metropolitan district council will be responsible for refuse collection, for some aspects of clean air and noise abatement, for other public health functions, including sewerage, for certain planning decisions. The metropolitan county council will be responsible for structure plan preparation and some other planning functions, for highway investment and public transport, for refuse disposal. The North West Water Authority will administer sewage treatment and disposal, water supply and river pollution control, whilst Her Majesty's Clean Air and Alkali Inspectorate will retain control over emissions from registered works. Even within those authorities, of course, different departments will be involved. The researchers believe that this machinery will not be sufficient by itself to achieve the desired improvement in the environmental quality. They recommend a unified system of control over all types of pollution. Priority should be given to schemes of co-ordination of pollution control between the authorities and departments concerned. They stress that early agreement on the schemes is more important at this stage than the precise working out of who does what or the setting up of a special planning authority. Agreements, they say, will need to include the objectives of pollution control, the setting of environmental quality standards for particular localities and procedures for consultation.

Reader Enquiry Service No. 7410

# The New Threshold

*The Club of Rome. The Octagon Press Ltd.*

This booklet, which is a new addition to the NSCA library, explains the conception of The Club of Rome and the work of its members. The following quotation from the section "Reassessment of Objectives" is of interest:

"In particular it was agreed that The Club of Rome is:

Not a group of advocates of zero growth, although we feel strongly that the nature, tendencies, qualities and consequences of growth require deep and continued analysis and discussion;

Not a club exclusively devoted to problems of industrialised societies, attempting to find solutions to the difficulties of affluence, but a group concerned with the world system as a whole and with the disparities which it includes;

Not a group of futurologists, but of individuals who realise the necessity of attacking, now, longer-term and fundamental problems which are difficult to approach with our present methods of government and which could give rise to irreversible situations; Not a political organisation, either of the right or of the left, but a free assembly of individuals seeking to find a more objective and comprehensive basis for policy making;

Not a body devoted to public propaganda for change —although, should we succeed in better delineation of the elements of the problematique, we are convinced that our results should be made known universally through appropriate national and international organisations and media."

Reader Enquiry Service No. 7411

# New additions to the National Society of Clean Air Library, available on Loan

- Duerden, C.** Noise Abatement. Butterworths, 1970.
- County Borough of West Bromwich Hygiene and Cleansing Department.** Annual Report 1972. HMSO.
- Health Department, City of Manchester.** Extract from Report on the Health of the City of Manchester 1972.
- The Club of Rome.** The New Threshold, 1973.
- HM Chief Inspector of Factories.** Annual Report 1972. HMSO. £1.
- Krenkel, P. A. and Parker, L. F.** Physical Engineering of Thermal Pollution. Butterworths, 1970.
- Danielson, J. A.** Air Pollution Engineering Manual, second edition. US Environmental Protection Agency, 1973.
- Wood, C. M., Lee, N., Luker, J. A., Saunders, P. J. W.** The Geography of Pollution, A Study of Greater Manchester. Manchester University Press. £2.00.
- US Environmental Protection Agency.** Indoor-Outdoor Air Pollution Relationships: Volume II, an Annotated Bibliography.
- The Association of Public Health Inspectors.** Conference and Exhibition, Eastbourne 1973.
- Centre for Environmental Studies.** 6th Annual Report. April 1972–March 1973.
- Lead Development Association.** Battery Truck Book.
- Szekely, J., Editor.** The Steel Industry and the Environment. Marcel Dekker, Inc. New York, 1973.



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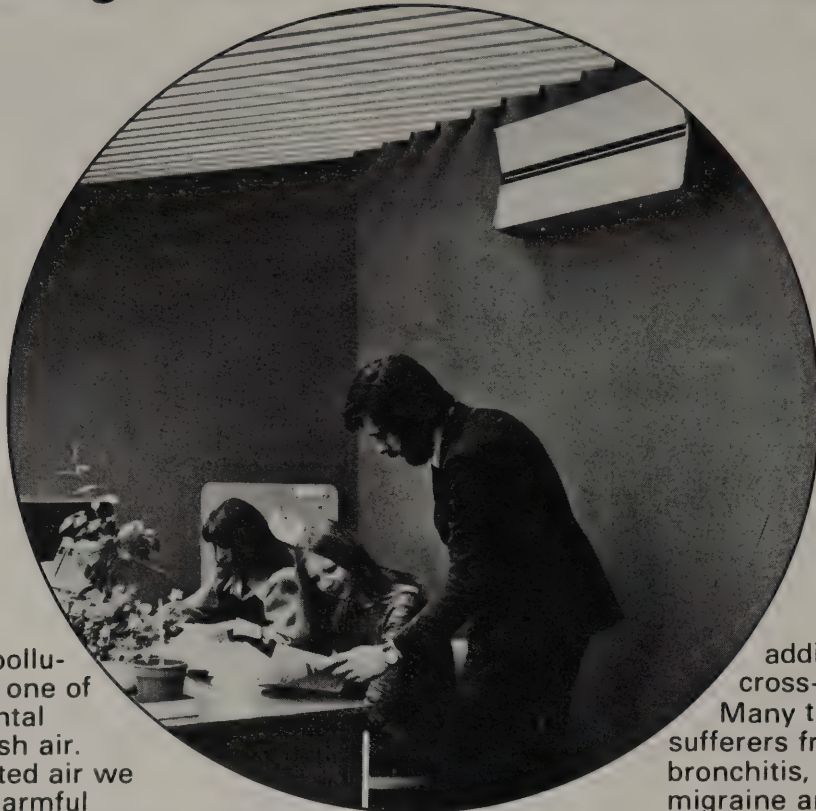
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Reader Enquiry Service No. 7412

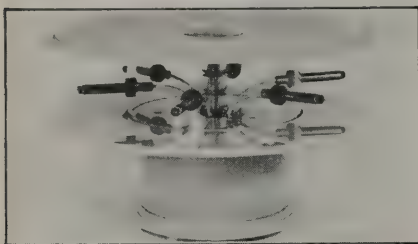
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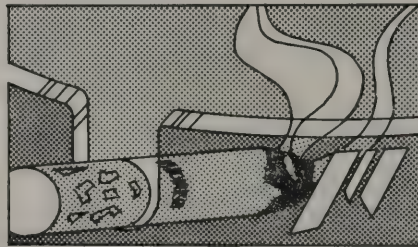
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# Electricity in the Air is Crucial to Health

by

T. Hannah

Most people feel "under the weather" at one time or another, and when they do the chances are that this phrase is an exact description of what is happening to them. The mood, with all its physical accompaniments, is frequently caused by an electrical charge in the air: positively charged ions.

Similarly, most people feel good—more cheerful and capable—in an atmosphere in which there is a preponderance of negatively charged ions.

The presence of ions in the air has been known almost since the discovery of electricity, but it has only been in this century that we have discovered that the amount of ions, of either charge, in the air, and in particular, the balance between positive and negative charges—ideally there should be more negative than positive—affects our mood and, often, our health.

Too many positive ions in the air make people feel heavy, lethargic and depressed, as many of us do just before a thunderstorm when the air is heavily weighted with positive ions. Similarly, most of us feel more lively in the sparkling, refreshing air after the thunderstorm is over, when there is a preponderance of negative ions. Ordinary people have always responded to the extremes of ionization in the air, even if they have not known anything about them. The responses are enshrined in the language: "the air is so heavy today"; "the air feels like champagne."

Air ion formation begins when enough energy acts on a gaseous molecule to eject an electron. According to an article in "The New Scientist" last June, "most of this energy comes from radioactive substances in the Earth's crust, and some from cosmic rays. The displaced electron attaches itself to an adjacent molecule, which becomes a negative ion, the original molecule then becoming a positive ion. Molecular collisions transfer the charge, so that positive charges come to reside on molecules with the lowest ionization potential, while electrons are attracted to the species of greatest stability. Next, neutral gas or water molecules cluster about the ions to form small air ions . . ."

Dr. Albert Krueger, Emeritus Professor of Bacteriology at the University of California, Berkeley, and one of the world's experts on ionization, told me in a recent interview that in normal clean air over land there are about 1,500 to 4,000 ions per cubic centimetre. Unfortunately, he added, this situation does not obtain in towns or cities, and even less so inside houses, offices, factories, and schools. Indeed, a 14-day study in 1971 by B. Maczynski<sup>1</sup> of an office containing four people showed that the small air ion concentration dropped as the day went on, falling on average to only 34 positive ions and 20 negative ions per cc of air. A test at a light industry area in San Francisco<sup>2</sup> showed a small air ion count of less than 80 ions per cc. Krueger told me that people

travelling to work in polluted air, spending most of the day in offices, factories, schools or hospitals, and living their leisure hours in cities, inescapably breathe ion-depleted air, and air in which the ratio between positive and negative is out of balance.

An extreme case of the effect of ionization on ordinary people is demonstrated in what happens to them in the various infamous "winds" that blow in parts of the world: the German "foehn" and the Middle Eastern "sirocco" or "sharav" among them. Pioneering research into the effects of these winds has been going on at the Hebrew University's Department of Applied Pharmacology, headed by Professor F. G. Sulman who has distinguished three categories of sharav-induced ailments. The first category of those sufferers are described as having symptoms of irritability, tension, electrified hair, migraine, nausea and vomiting. Sulman and his colleagues have found these to be caused largely by an excess of positive ions in the hot dry atmosphere.

Many of the people who suffer in this way are so sensitive to electrical stimuli in the atmosphere that they tend to suffer a day or two before the wind itself actually starts. One of the findings of Sulman and his associates is that when these patients are exposed to a negative-ion generator, which redresses the atmospheric balance, they are considerably relieved.

Krueger told me that there is increasing evidence that overall ion-depletion, and a predominance of positive ions in the air, leads to "discomfort, enervation, a feeling of tiredness, and loss of physical and mental efficiency". What is more, he added, this even tends to happen in the "clean" air of rural offices and institutions, such as libraries and schools. But there is also much evidence, of which Professor Sulman's results are an example, that substantial increases in air ions can have "highly beneficial effects". Krueger told me: "I think this has a great potential for application. All we do in industry, and in our immediate environment, where we work and live, is to strip ions out of the atmosphere—so that essentially we are living in Faraday cages, with not nearly enough ions."

The laboratory evidence which indicates how useful ionization of the air, and negative-ionization in particular, can be, is considerable. A fragment of it can only be mentioned here, but indicates the potential and range of the subject and its applications.

In Columbus, Ohio,<sup>3</sup> scientists found an increased learning and performance ability in rats exposed to ionized air. The effect was more pronounced in older rats than younger ones. In Milan,<sup>4</sup> a study showed that mice exposed to negative ions required more ether for the same level of anaesthesia—and recovered faster. All the animals in this particular series of experiments also showed a marked increase in activity after their exposure to ionized air.

At the University of Copenhagen,<sup>5</sup> mice in a multi-chambered cage preferred a cubicle with negative-ionization, and given a choice of other atmospheres, sought this one out.

In California,<sup>6</sup> experiments showed that ionized atmospheres exerted a moderate lethal effect on bacteria contained in small droplets, and inhibited the colonial growth of bacteria and fungi on agar surfaces. Research in Hungary<sup>7</sup> also has shown a 70 per cent reduction of bacteria in a negatively ionized test chamber. Again in California, Krueger found that air ions influenced survival in respiratory diseases in mice. Positive ions substantially increased the death rate of mice infected with measured doses of a fungus (*Coccidioides immitis*), a bacterium (*Klebsiella pneumoniae*), or a strain of influenza virus. Ion-depleted air also increased the high death rate in mouse influenza, while a high concentration of negative ions decreased the death rate.

In Hungary, a series of experiments<sup>8</sup> showed that rats learned "defensive" reactions to dangerous situations significantly faster in a negatively-ionized atmosphere. Their speed in discriminating between dangerous and safe situations also increased. Their performance was not at all impaired by the introduction of heavy tobacco smoke into the negatively-ionized environment, and was sustained even during a stay in an atmosphere charged with positive ions if they had been sufficiently exposed to negative ions first.

There is now a great weight of such evidence which indicates that in the laboratory negative ions help the well-being and performance of living organisms and experimental animals.

In addition to small animals, experiments<sup>9</sup> over the past 17 years were conducted to detect ion-induced physiological changes in plants. The subjects were maintained in a controlled micro-environment supplied with pollutant free air, the sole variable being the concentration of air ions. Plants appear to benefit from increases in both positive and negative ionisation, and the rate of growth in higher plants such as barley, oats and lettuce, was marked. With seedlings, the increase in growth rate in ionized atmospheres (containing about 10,000 positive or negative ions), was as much as 50 per cent, and the protein, sugar or chlorophyll content of the plant remained unaltered.

But, how do human beings respond? Again, the weight of clinical evidence is also growing, some of which is summarised here. In Germany<sup>10</sup> results based on the ionization treatment of 3,000 cases of bronchial asthma were reported. These showed that 83 per cent of the people in the under-20 age group were completely cured, and a further 15 per cent considerably improved. In the 40-60 age group, 53.7 per cent were completely cured and a further 44.6 per cent considerably improved. A study of 800 children with whooping cough was also done in Germany. All the children obtained complete freedom from attacks.

In Italy<sup>11</sup> it has been demonstrated that negatively ionized air produced definite changes in the functioning of the endocrine system. Two of several findings are particularly interesting: first, the correlation with the chemical regulator serotonin and its release from the tissue, a central factor in many migraine conditions. The second is the effect on the cells of the suprarenal glands

which indicates the mechanism underlying the beneficial results obtained with rheumatic diseases.

In Russia,<sup>12</sup> clinical findings are reported which show that exposure to high concentrations of negatively ionized air improved general health and acted as a normalizing agent on a number of physiological systems, including the central nervous system. Complete relief in 55 per cent of all bronchial asthma cases was obtained, and lasted over a period of six months. There was a marked improvement in a further 35 per cent of such cases.

Negatively ionized air in the treatment of burns has been in regular use in a Philadelphia hospital for some years, and a paper<sup>13</sup> on the subject states that the amount of secretion and the number of infections is substantially reduced. The fetid odour usually accompanying severe burns is completely controlled, and in the great majority of cases a complete cessation of pain is achieved in 10-15 minutes with no need for analgesics. The healing process is also speeded up.

A number of groups around the world have produced clinical studies which observed the level of vitality, optimism and general well-being in negatively-ionized atmospheres. As long ago as 1939, experiments were reported from Japan<sup>14</sup> which showed that if temperature, humidity and carbon-dioxide were all kept at comfort levels, and only the ion level was reduced, people suffered from nervous symptoms such as perspiration and depression. More recently, in Argentina,<sup>15</sup> it was found that patients suffering from anxiety lost their symptoms after a series of sessions in a negatively ionized room. They needed from 10 to 20 such sessions, some of which lasted for no more than 15 minutes, and which were never longer than two hours. There are also many reports from America, Germany, Russia and Italy which show that negative-ionization can have a pronounced effect on respiratory disorders, particularly in cases of asthma, bronchitis and hayfever.

Very little work on ionization has been done in Britain. Indeed, the first survey of any kind that I can trace was begun this year, when an infant school in Sussex was supplied with ionizers to see if cross-infection from colds could be controlled. Infants were chosen because they did not move from room to room as much as other age-groups, and could be exposed for up to five hours of negative ionization daily.

In the absence of clinical and other studies, though, there is a large and highly suggestive weight of anecdotal evidence accumulating through the offices of the only British organisation dealing with ionization. Reports are being received there on improvements to sufferers from migraine, asthma, bronchitis, hayfever, and the like. An interested company, encouraged by the overwhelming evidence of its own records, commissioned two professional statisticians to carry out an independent survey. They arrived at highly significant answers which fully supported the company's records, and which are to be published shortly.

But perhaps the reports relating to general well-being are the most interesting and useful to ordinary people. It is ordinary people who spend their time in ion-depleted atmospheres, who become run-down and less resistant to cross-infections and whose moods are frequently affected simply by the predominance of the "wrong" ions in the air. It is now well-known that air conditioning, like the electrical system of the motor-car, tends to strip the air of ions, and this air is already depleted by pollution and city conditions.

Clearly, we could usefully begin to take steps to improve the ion balance in our environments. Two Russian scientists, Nefedov and Ansimov, who conducted an impressive series of tests to develop optimum conditions for space flight, suggested that ionization in the Russian space capsule be increased to 2,000 ions per cc. Any enclosed atmosphere with conditioned air, not only a capsule, is likely to be depleted of ions, and probably have an excess of positive ions. If the level of ionization, and the balance of ions, is restored to more nearly the "normal" level, from the published reports received, it seems clear that respiratory diseases, influenza, energy, vitality and mood, will all be improved.

In a study in a Swiss bank in 1972, 309 volunteers worked for 30 weeks in an area where the air was treated to develop a high ratio of negative to positive ions. A further 362 controls worked in untreated air. During the test the ratio of days lost from respiratory illness in the two groups was a remarkable 1 to 16.

I was told of something similar when I visited the data-processing room of a large bank in South Africa. Each day about £200,000,000 worth of cheques are processed there. Within six weeks of negative ionization being installed, the error factor was reduced from  $2\frac{1}{2}$  per cent to about  $\frac{1}{2}$  per cent. This represented an enormous saving in money. What was more, the employees were working faster, and feeling better. During the hour I spent there, employees from all over the building would pop in for a few minutes. "I felt a bit low, so came to breathe the air in here", was their explanation.

There are a number of explanations about the way in which negative ions work in the body, but this activity is

not yet really understood. Krueger has suggested that positive ions seem to raise, while negative ions lower, blood levels of serotonin, a powerful hormone which acts in a number of different ways on the nervous system. In the mid-brain, serotonin has a function in various processes such as sleep, the transmission of nerve impulses, and the development of mood. Professor Sulman has also made extensive measurements which confirm one of the effects of air ions on the serotonin level.

It has also been found that negative ions allow the lungs to take up an extra molecule of oxygen when the air is negatively charged. This happens whether the charge is from a scientific instrument or from nature, such as after a thunderstorm, and in certain natural environments, near waterfalls, on mountain tops, and certain parts of the desert when the wind whips the sand.

There is one further bio-chemical explanation. The bronchial tubes and windpipes are lined with cilia, small whip-like filaments, which beat at about 900 times a minute to keep air passages free from dust and pollen. Negative ions speed up the ciliary beat to 1,200 a minute; positive ions slow it down to 600. In the first place the flow of mucus is increased. In the second it drops.

As research continues explanations about how it works will be forthcoming. The question *that* it works, particularly on ordinary people in ion-depleted environments, is becoming generally accepted. Perhaps we can look forward to a further improvement in the air we breathe, where we work and where we live, in the very near future.

As with so many other things, the equipment to achieve this already exists. All we have to do is use it.

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## in the Year 1971-72

This table was first shown in the Summer 1973 edition of 'Clean Air', when an incorrect figure was given for 'Sulphur oxides overall total'. This reprint shows corrected figures.

Table 1

### Estimates of Pollution by Smoke and Oxides of Sulphur in Million Metric Tonnes from the Main Uses of Primary Forms of Energy

(one metric tonne = 0.9842 long ton)

**Estimates prepared by Albert Parker, CBE, DSc.**

Figures for quantities of forms of energy were derived from the Digest of United Kingdom Energy Statistics issued in 1972 by the Department of Trade and Industry. The percentages of sulphur in the various grades of fuel used in making the estimates of pollution by sulphur oxides were provided by the coal, oil and electricity supply industries.

Form of Energy and Class of Consumer											Quantity of Energy	Quantity of Pollutant
<b>Smoke</b>												
<b>Coal</b>												
Domestic, including miners' coal .. .. .											15.2	0.47
Railways .. .. .											0.1	small
Industrial and miscellaneous including collieries .. .. .											17.2	0.05
											32.5	0.52
<b>Sulphur oxides</b>												
<b>Coal</b>												
Domestic, including miners' coal .. .. .											15.2	0.29
Electricity power stations .. .. .											68.9	1.99
Railways .. .. .											0.1	small
Collieries .. .. .											1.3	0.03
Industrial and miscellaneous .. .. .											17.2	0.42
Coke ovens .. .. .											20.5	0.09
Gas supply industry for gas making .. .. .											1.1	0.01
Low temperature carbonization plants .. .. .											2.5	0.01
Patent fuel plants .. .. .											1.4	small
											128.2	2.84
<b>Coke (excluding consumption in gas works and blast furnaces)</b>												
Domestic, including other manufactured solid smokeless fuels .. .. .											5.1	0.08
Industrial and miscellaneous .. .. .											3.0	0.05
											8.1	0.13
<b>Oil</b>												
Domestic .. .. .											3.0	0.02
Industrial and commercial .. .. .											53.4	2.31
Gas supply industry .. .. .											1.9	small
Road transport .. .. .											20.1	0.05
Railways .. .. .											1.1	0.02
Marine craft (inland) .. .. .											1.4	0.04
											80.9	2.44
Sulphur oxides overall total .. .. .												5.41
<b>Coal equivalents in m. tonnes of energy consumption in 1971-72</b>												
Hydro-electricity .. .. .											1.8	0.5%
Nuclear-electricity .. .. .											9.8	3.0%
Natural gas .. .. .											26.2	8.0%
Coal .. .. .											140.9	42.9%
Oil (1 tonne=1.7 tonne of coal) .. .. .											149.8	45.6%
Total coal equivalent .. .. .											328.5	100.0

The amount of 53.4 m. tonnes of oil used in 1971-72 for industrial and commercial purposes is equivalent in heating value to about 90.8 m. tonnes of coal, which if used for the same purposes would have produced about 0.27 m. tonnes of smoke and 2.3 m. tonnes of oxides of sulphur. The overall total amount of 5.41 m. tonnes of oxides of sulphur is 1.647 per cent of the total coal equivalent of 328.5 m. tonnes.

# Estimates of Air Pollution in the United Kingdom in the Year 1972-73

Table 1

### Estimates of Pollution by Smoke and Oxides of Sulphur in Million Metric Tonnes from the Main Uses of Primary Forms of Energy

(one metric tonne = 0.9842 long ton)

**Estimates prepared by Albert Parker, CBE, DSc.**

*Figures for quantities of forms of energy were derived from the United Kingdom Energy Statistics issued in 1973 by the Department of Trade and Industry. The percentages of sulphur in the various grades of fuel used in making the estimates of pollution by sulphur oxides were provided by the coal, oil and electricity supply industries.*

Form of Energy and Class of Customer										Quantity of Energy	Quantity of Pollutant
<b>Smoke</b>											
<b>Coal</b>											
Domestic, including miners' coal .. .. .										14.5	0.45
Railways .. .. .										0.1	small
Industrial and miscellaneous including collieries .. .. .										15.9	0.05
										30.5	0.50
<b>Sulphur oxides</b>											
<b>Coal</b>											
Domestic, including miners' coal .. .. .										14.5	0.28
Electricity power stations .. .. .										66.7	1.57
Railways .. .. .										0.1	small
Collieries .. .. .										1.4	0.03
Industrial and miscellaneous .. .. .										14.5	0.34
Coke ovens .. .. .										20.4	0.10
Gas supply industry for gas making .. .. .										0.6	0.01
Low temperature carbonization plants .. .. .										3.1	0.01
Patent fuel plants .. .. .										1.5	small
										122.8	2.34
<b>Coke (excluding consumption in gas works and blast furnaces)</b>											
Domestic, including other manufactured solid smokeless fuels .. .. .										4.7	0.08
Industrial and miscellaneous .. .. .										2.9	0.05
										7.6	0.13
<b>Oil</b>											
Domestic .. .. .										3.5	0.02
Industrial and commercial .. .. .										57.9	2.61
Gas supply industry .. .. .										1.6	small
Road transport .. .. .										21.2	0.05
Railways .. .. .										1.0	0.02
Marine craft (inland) .. .. .										1.5	0.03
										86.7	2.73
Sulphur oxides overall total .. .. .											5.20

**Coal equivalents in m. tonnes of energy consumption in 1972-73**

Hydro-electricity .. .. .	2.0	0.6%
Nuclear-electricity .. .. .	10.7	3.2%
Natural gas .. .. .	37.3	11.2%
Coal .. .. .	122.8	36.9%
Oil (1 tonne=1.7 tonne of coal) .. .. .	160.1	48.1%
<b>Total coal equivalent .. .. .</b>	<b>332.9</b>	<b>100.0</b>

The amount of 57.9 m. tonnes of oil used in 1972-73 for industrial and commercial purposes is equivalent in heating value to about 98.4 m. tonnes of coal, which if used for the same purposes would have produced about 0.29 m. tonnes of smoke and 2.5 m. tonnes of oxides of sulphur. The overall total amount of 5.20 m. tonnes of oxides of sulphur is 1.562 per cent of the total coal equivalent of 332.9 m. tonnes.

Table 2

**Estimates of Pollutants from Road Vehicles in the United Kingdom in the Year 1972-73 in Million Tonnes**

	Consumption of Motor Spirit	15.90 m. tonnes
	Consumption of Derv Fuel	5.25 m. tonnes
<i>Pollutant</i>	<i>Petrol Engines</i>	<i>Diesel Engines</i>
Carbon monoxide .. .. .	7.5	0.11
Hydrocarbons .. .. .	0.38	0.022
Aldehydes .. .. .	0.01	0.003
Oxides of nitrogen .. .. .	0.25	0.08
Oxides of sulphur .. .. .	0.016	0.03

The estimated quantity of carbon monoxide discharged into the air from the other industrial and domestic uses of all fuels in the year 1972-73 is about 9 m. tonnes including about 3.5 m. tonnes from domestic heating appliances. These discharges are above ground level whereas the discharges from road vehicles are at ground level.

**Lead**

The total amount of lead in the lead alkyl compounds added to the 15.9 m. tonnes of motor spirit used in the United Kingdom in 1972-73 was about 11,750 tonnes. The lead would be converted to complex compounds and about one-third would be retained partly in the lubricating oil and partly in the exhaust system. This means that the amount of lead in the compounds discharged in the exhaust gases from petrol driven vehicles in 1972-73 was about 7,800 tonnes

**Industrial Wastes —****A New Information Bulletin**

Harwell has introduced a new publication "Industrial Wastes Information Bulletin" which aims to keep industry and public authorities aware of new developments over the whole field of industrial waste management, treatment and disposal. The aim of the bulletin is to provide, on a subscription basis, a monthly review of recent developments, a comprehensive and up-to-date bibliography of published information and access to a computerised information retrieval service.

Journal articles, patent specifications, commercial literature, scientific reports, etc. from the United Kingdom and overseas will be included in the material covered by the bulletin, and held in the information store. This store will also contain relevant material dating back for a number of years, and this will be reflected in the contents of the early issues of the bulletin.

The subscription charge is £24 per annum (U.K.). Enquiries about the bulletin and other information services should be directed to: Miss Madeline Lund, Industrial Wastes Information Bureau, Hazardous Materials Service, Building 151, A.E.R.E., Harwell, Didcot, Berks.

**LETTER**

*The Editor,  
Clean Air*

Sir,

I would appreciate hearing from anyone regarding the effects of pollution on emotions and mental health, i.e., letters, case-reports, reprints, books, etc. Please send the information to:

Claude A. Frazier, M.D.,  
4-C Doctors' Park,  
Asheville, NC 28801,  
U.S.A.

Thanking you in advance, I remain

Sincerely,

CLAUDE A. FRAZIER, M.D.

"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## UNIDO

Studies on the risks for the environment by the iron and steel, rubber and leather industries are amongst the six projects on ecological effects of industrial development which will be carried out by the UN Industrial Development Organization, with financial aid of UNEP. UNIDO has also begun to include environmental problems in its education programmes. These studies aim at determining the risks of underestimating ecological factors at the establishment of new industries, proposing solutions and assuring that in future UNIDO projects these problems will be taken into consideration.

## EUROPE

A research project on the recycling of raw materials is to be carried out by the Joint Research Centre in Ispra, as part of the Community multi-annual research programme put forward by the European Commission and adopted by the Council of Ministers in June 1973. For the time being, research will be concentrated on chromium, lead, tin and platinoids because of their expected scarcity in the near future or because, when disposed of, they pollute the environment.

## AUSTRIA

A new law on the protection of the environment is currently being drafted at the Ministry for Public Health. The bill includes a system of penalties, the application of the polluter-pays-principle, a compensation fund for damage and a warning system for environmental pollution.

## DENMARK

A Royal Decree of 5th October has enlarged the Ministry of the Environment which will now be headed by Mr. Helge Nielsen. The new Ministry will now deal with pollution abatement, nature conservation and landscape planning, natural resources, protection of monuments and sites, urban and regional planning, state forests and dunes.

## FRANCE

The 3rd International Exhibition "Man, Air and Water, Noise and Waste" is to be held on the 10th to 14th September, 1974, at the Exhibition Ground of the Paris Airport at Le Bourget. The Exhibition is sponsored by the Ministry for the Protection of Nature and the Environment and is being organized by TECHNOEXPO S.A.

The 7th International Conference of the "International Association on Water Pollution Research" (I.A.W.P.R.—A.I.R.P.E.) will be held in Paris at the same time as the exhibition and in addition there is to be a colloquium on Air, Noise and Waste Techniques as part of the exhibition, organized in co-operation with the French magazine "L'Usine Nouvelle" and the trade unions concerned.

## SWITZERLAND

The 6th International Exhibition for Environmental Sanitation "PRO AQUA—PRO VITA" will take place in the halls of the Swiss Industries Fair Basle, from 11th to 15th June 1974.

The subjects covered will include: collection of water, lifting of water and sewage (pumps), water conduits and sewers, mechanical treatment of water and sewage, biological, thermal and electrical treatment of water and sewage, chemical treatment of water and sewage, disposal of garbage and solid wastes, air pollution control and noise control.

Again, the exhibition will be accompanied by Technical Meetings which stand under the general heading "Energy and Environment" and in addition the "International Congress of the International Association against Noise (AICB) will be held.

The 4th International Symposium on "Recent Advances in the Analytical Chemistry of Pollutants" will also be held in Basle, on the 17th to 19th June 1974, in the SANDOZ Congress Centre.

## BELGIUM

A law on nature conservation came into force on 11th September and a law on noise abatement on 14th September. An emergency bill on toxic waste disposal is being drafted.

CEBEDEAU—BECEWA are holding the 27th International Days 1974 in Liège, Belgium, on 6th to 9th May 1974. Subjects covered are: atmospheric environments noxious to man, environments noxious to materials, made to measure water treatments and water problems in food industry.

Papers will be presented in English, French or Dutch (no simultaneous translation) and discussions in English, French or Dutch with the aid of a translator.

## UNITED STATES

In a related effort, the Environmental Protection Agency (EPA) approved a variance to New York State's sulphur oxides regulations to help relieve the national shortage of low sulphur fuels. The variance allows Northville Industries, a fuel oil supplier, to market residual and distillate fuel with a sulphur content of 2 per cent by weight. The New York State regulation for sulphur content in New York City and Suffolk County is .3 per cent for residual fuel oil and .2 per cent for distillate. Northville Industries supplies about 30 per cent of the distillate market and 15 per cent of the residual oil market in Nassau and Suffolk Counties.

The State proposed to grant the variance for Northville in October following a public hearing. The State has assured EPA that the variance will not jeopardize the maintenance of air quality standards and that any cost differential accruing to the benefit of Northville Industries will be passed along to the consumer.

#### AUSTRALIA AND NEW ZEALAND

Two local bodies have introduced New Zealand's first local by-laws governing Insulation.

Waimairi County (Building) By-Law 1971 No. 1 (Thermal Insulation), which came into force on 1st November 1971.

Christchurch City Council.

These by-laws were introduced primarily with the object of reducing air pollution by more efficient use of fuel. Winter air pollution in these districts is quite severe, largely as a consequence of burning soft coal in open fires. Winter inversions are very marked in the East Coast of the South Island.

The 1975 International Clean Air Conference "Pollution, Man and Nature" is to be held in Rotorua, New Zealand, on 17th to 21st February, 1975.

The conference topics are:

- Air Pollution from Natural Sources—Geothermal Areas, Bush Fires, Desert Dust, Pollen etc.
- Air Pollution from Motor Vehicles, other Mobile Sources and Stationary Sources, with Reference to the Energy Crisis.
- International Trends in Air Pollution Control including—Should the Polluter Pay.
- Urban Planning, Pollution Models and Pollution Control.
- Developments in Legislation, Criteria and Standards.
- Air Pollution—Effects on Man, Animals and Plants.
- Meteorology and Dispersion of Air Pollutants, Local, National and Global, including Radioactive Fallouts.
- Monitoring and Analytical Methods of Air Pollution Control.
- Control of Industrial Process Emissions.
- Noise as an Air Pollutant.

An Exhibition of an international nature will be organised as part of the conference.

#### JAPAN

The Government has decided to name attachés for the environment in Japanese embassies in the principal industrialised countries. These attachés will be charged with gathering information and carry out studies on the environment in their host countries.

# Nailsea

## Dust control equipment

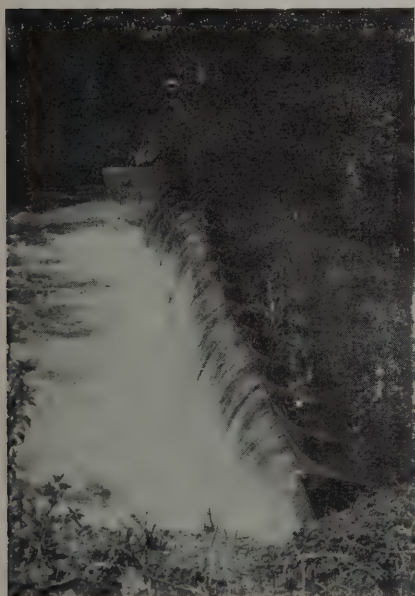
**▶▶PNU-JET▶▶**  
DUST CONTROL EQUIPMENT

# INDUSTRIAL NEWS

## Portable Dam For Controlling River Levels

A self-anchoring portable fabric dam for controlling river levels has been developed by the Flexible Structures Division of John Hudson (Birmingham) Limited. The Portadam consists of a light metal demountable support structure carrying a specially tailored fabric membrane which seals against the sides and base of the channel without need of anchorage or foundation. Construction is swift and simple, and site preparation negligible.

The metal support structure can be adjusted to provide a completely level top in varying depths of water. The structure breaks down into standard, interchangeable components. Carriage is thereby greatly simplified, and equipment may be compactly stored to deal with a wide range of situations.



The Portadam is clamped firmly in position by hydrostatic pressure, and preparation consists solely of protection for the downstream side to prevent scour where water is to overflow the dam.

The standard Portadam will hold any depth of water up to 1.3 m (4.5 ft), while a heavy grade can be provided to hold up to 1.8 m (6 ft). The

fabric portion can be made in single lengths for barriers up to 60 m (200 ft). For ease of handling it is desirable that longer lengths be joined on site, and systems to facilitate this are available.

The Portadam is being used with notable success for the creation of deep water pools and the oxygenation of water with the double purpose of encouraging fish conservation and propagation, and reducing river pollution. When seasonal rains raise the water level, the Portadam is very simply dismantled.

The Portadam has also been successfully used for damming the outflow of fresh water from a steel works while jammed sluice gates were repaired, damming the famous St. James's Park Lake in London for cleaning purposes—undertaken in sections so that its famous duck population would not be unduly disturbed—and for temporarily diverting the course of a river while pipes were laid beneath its bed. Other applications include irrigation and flood control.

The Portadam is manufactured under licence from Britain's National Research Development Corporation, who sponsored some of the early development work following demand from overseas, particularly from tropical and semi-tropical areas such as Africa, where there are severe irrigation and fish conservation problems due to alternating heavy rainfall and drought.

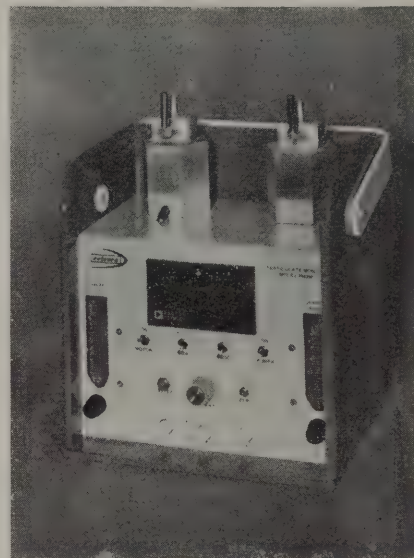
Among its advantages are its durability, mobility and ease of erection. A 30 ft dam, for instance, can be erected by two unskilled men in an hour. There is no theoretical limit to the width of rivers in which they can be used.

Portadams can be installed on any firm base such as concrete, steel, tarmac, shingle, gravel, sand, turf or clay. The Flexible Structures Division can advise on the adaptability of Portadams to beds of soft mud or silt.

Reader Enquiry Service No. 7415

## Celesco Opacity and Particle Meters

T.E.M. Sales have been appointed exclusive U.K. Sales and Service Distributors for the range of opacity meters manufactured by Celesco Industries Inc., of California. Included in this range is a portable particulate mass monitor (see photograph) which gives real-time measurements of mass concentration and accumulated mass.



Some features of the monitor are its use for both ambient and source measurement, retention of samples for laboratory analysis, measurement of particulates from 0.1 to 100 microns and digital or analogue meter readout.

Reader Enquiry Service No. 7416

## Sophisticated Refuse Disposal Plant to be Commissioned at Rochdale

The opening of Rochdale's new £730,000 pollution free refuse incinerator on 12 January 1974, by Councillor Alan Platt, J.P., Chairman of the Highways Committee, marked the completion by Redman Heenan Froude of its eleventh continuous incineration plant since this system was introduced in Britain.

Undoubtedly one of the most modern and sophisticated refuse disposal plants in Britain today, it will be capable of burning without the emission of pollutants eight tons of refuse an

hour and consists basically of an incinerator fitted with a Heenan Nichols rocker grate, a gas cooler and highly efficient electrostatic precipitator.

Refuse arriving at the plant is tipped into a 2,000 cu yd reception pit, six steel, knee-type hydraulically operated doors dividing the pit from an enclosed vehicle manoeuvring area. The space above the pit is kept slightly below atmospheric pressure by means of the combustion air fans for the incinerator thus preventing the escape of airborne dust. A remotely controlled electric overhead crane and grab transfers the refuse from the pit to the furnace feed chute.



The heart of the system is the Heenan Nichols grate and allied dust collection plant which will give pollution-free burning. Heenan Nichols grates are formed from rows of heavy cast-iron segments set at an incline; these are rocked progressively to the vertical position and returned, the burning refuse, as a consequence, being agitated and moved down the grate at a speed which can be varied to suit the particular refuse being burnt.

On leaving the furnace, the products of combustion are cooled by water sprays installed in a tower above the furnace and then pass to the electrostatic precipitators to remove the fly ash. Ash and clinker discharged from the grate are quenched in a water-filled trough and then elevated, together with the riddlings, to storage bins ready for eventual removal by lorries. Ferrous metal is extracted from the residuals by a magnet and then baled.

The complete plant is regulated from a central control room situated at the discharge end of the furnace; this contains all the necessary alarms and instruments. In addition, an observation window provided in the end

wall of the furnace enables the controller to see the state of the fire and the quality of the burn out. A separate furnace has been provided to deal with small carcasses and other items not suitable for the main furnace. Water for use within the plant is drawn from the nearby river Roch: this is filtered and held in a tank having a capacity sufficient to give four hours operation.

Reader Enquiry Service No. 7417

### **Navy Propellers Assembled Under Clean Air Conditions**

In the heart of industrial London, in the centre of a vast metal foundry, is the purest air in the Metropolis. For this air is filtered and changed 180 times an hour!

Such scrupulous attention to the expulsion of even the minutest particles of dust is maintained so that absolute precision is guaranteed in the clean air section in the Controllable Pitch Propeller assembly shop of S.M.M.—Stone Manganese Marine Ltd.

From their range, covering propulsion for all types of shipping and embracing the specialised requirements of Naval installations, the manufacture of Controllable Pitch Propellers is concentrated at the Company's Greenwich Works. Here, the production facilities have recently been further extended with the installation of what is believed to be Europe's first high bay laminar flow tunnel. This "clean air" section provides a complex filtration system to ensure that no dust or foreign particles adhere to the precision engineered components during assembly.

To achieve this degree of precision and perfection, Stone Manganese Marine called in John Bass Ltd., who designed, built and installed the laminar flow tunnel.

It is 20 feet high, 21 feet wide and 30 feet long. Forty absolute filters and prefilters are employed in the system, guaranteeing non-ingression of dust from the open end of the tunnel to such a high degree of efficiency that clean air to better than class 10,000 is maintained throughout.

As each year passes, a higher proportion of the Company's output revolves around its Meridian design Controllable Pitch Propellers. These are so designed that the angle of the blades on the main hub can be altered, allowing enormously increased manoeuvrability, even to reversing the

blades whereby the ship, without resort to a gear box, can be moved astern.

All components for both hubs and oil transfer boxes, are degreased before entering the clean air tunnel for final assembly.

Reader Enquiry Service No. 7418

### **First Sixty Nurseries to Strike Roots Shortly**

Trees for People are pleased to announce that the first sixty tree nurseries to be run by schoolchildren with their teachers, will be inaugurated shortly in many parts of Britain.

Tens of thousands of seedlings representing a dozen different species are now reaching schools all over the country.

One of the projects will include one thousand beech trees for an Isle of Wight school and others, containerised trees for schools with no bare soil to plant in.

A further one hundred applications from schools are now being processed and TFP hope that by the end of 1977, one thousand nurseries with a growing potential of half a million trees will be in operation.

Where the County Councils provide no assistance at all, some schools will receive scaled down tools and a small financial grant for incidentals connected with the work.

Trees for People hope that child involvement in tree propagation and planting will eventually reduce the incidence of vandalism and replace the millions of trees Britain loses yearly and which are never replaced.

The School Nurseries Project has been made possible with the help of a very generous grant from CONOCO LIMITED. TFP is a totally voluntary body still seeking Government assistance for its important environmental and educational work.

Reader Enquiry Service No. 7419

### **Kemble's Solve Wood Waste Problem**

An incinerator capable of destroying up to 14 yd<sup>3</sup> per 8-hour day of assorted wood waste and general factory refuse, has been designed and erected at the recently-built factory of piano manufacturers, the Kemble Company, in Milton Keynes, Bucks., by The Incinerator Company Limited. The waste problem was created by a combination of increased output and by the variety of woods employed in piano manufacture.

By establishing the weight and volume of waste to be destroyed, as well as its calorific value, The Incinerator Company was able to design a unit capable of handling the projected increase in waste. It consists essentially of a main combustion chamber, a secondary combustion chamber, and a centrifugal water trough dust catcher built on the side of the furnace. An extraction system from each wood-working machine brings sawdust and wood chips to the plant. Larger off-cuts and general factory waste are fed by hand.

Woodworking establishments can seldom operate at a constant rate; frequent variations in the amount of waste arriving in the furnace would therefore produce variations in its temperature, and so cause thermal shock damage to its refractories, even though these are made of best quality Scotch firebricks containing 38/42% alumina. Spasmodic burning would also create a smoke problem.

To overcome these difficulties, the extraction system feeds the waste into a storage hopper which contains an agitator and its own extractor to move the refuse regularly into another smaller hopper capable of holding about 6 ft<sup>3</sup> of waste. A screw conveyor in the base of this hopper meters the waste into the airstream of a small fan which blows the waste into the furnace. The main hopper can hold 96 ft<sup>3</sup> of waste, i.e. about 2-2½ hours storage capacity. Thus, during breaks in the working day a steady rate of burning is ensured.



A regular burning rate is further maintained by hand-feeding the large offcuts and bulky waste at the most suitable times. This is done through roller-type doors which provide an opening of 2 ft x 2 ft so that most

articles can be put in without having to break them up. An even combustion is assisted by the operation of simple adjustable inlets providing ample supplies of secondary air. The whole arrangement is such that "easy burning" is achieved, i.e. the operator does not have to be in constant attendance.

The combination of steady feed and correct design of furnace chambers ensures that most of the fine carbon particles which constitute smoke are destroyed; but nevertheless an after-burning chamber with a temperature controlled burner is incorporated in the plant. However, incombustible debris (fly ash) entrained in the gas stream must still be removed. This is done by a refractory-lined dust catcher fitted to the side of the plant.

The catcher imparts a thoroughly centrifugal motion to the gas stream, and then expands the gases so that they lose their carrying capacity and deposit solid particles in a water trough below. The arrangement is more expensive than many conventional water trough designs, but is said to be much more efficient. A 40 ft high steel chimney completes the installation.

Reader Enquiry Service No. 7420

#### **BP Spend £1 Million on Pollution Control in Scotland**

John Zink have received an order from Matthew Hall Engineering Limited for the engineering design, equipment supply and commissioning of an integrated flare system for BP's Crude

Oil and Gas Treatment Facilities at Kinneil Terminal, Grangemouth. The system has been designed to minimise atmospheric pollution in the event of an emergency when the gas, which is normally recovered for use as a fuel, has to be flared.

The main contractors for the project are Matthew Hall Engineering Limited and the flare system is worth in the region of £1 million.

The equipment being supplied by John Zink includes one elevated flare and four ground flares with a design disposal capacity of 350,000 lbs per hour of hydrocarbon gases. Crude oil is piped from BP's North Sea Forties Field to Grangemouth where the gas, consisting mainly of methane, ethane and propane and having an average molecular weight of 42, is recovered as liquified petroleum gases and sales gas.

In a major emergency, the elevated flare is capable of handling the full design load of 350,000 lbs per hour. The four ground flares have a total capacity of 175,000 lbs per hour,

sufficient to handle disposal of gases in the event of a shutdown or failure in either of the two identical gas separation units being installed on the site.

Care has been taken to prevent flash-backs by the installation of water seals at critical positions while knock-out drums avoid the danger of liquid hydrocarbon carry over into the flaring system. Special features include purpose designed hydraulic dump vessels which enable automatic bypass of low pressure vent valves in the event of a valve failure.

The elevated flare has been fitted with a special John Zink type flare tip for low noise and smokeless combustion. The ground flares are designed to be smokeless and to have low luminosity and noise levels to protect the environment.

The flare system is provided with sophisticated instrumentation to ensure safe and efficient operation.

Reader Enquiry Service No. 7421

#### **U.S. Power Stations Order Metro-Flex Pollution Control Equipment**

One of the world's largest power plants, the Tennessee Valley Authority's Paradise Power Station (900MW), together with the B.C. Cobb plant in Michigan, and the Southern Illinois Marion Power Station have all placed orders for Metro-Flex pollution control equipment.

The orders, worth £115,000 are for the supply of two of the latest design Simplex and nine Glandular Spade valve isolators.

The sizes range from 9 ft x 13 ft to 13½ ft x 20 ft and are all fitted with the patented austenitic flexible steel loop seals which it is claimed usually give a sealing efficiency of 100%, but always in excess of 99.95%. In the case of the Tennessee Valley Authority, the valves will be used for the programmed isolation of the gas recirculation fans, a feature which has hitherto not been possible due to the significant leakage past the conventional louvre type dampers. This fault cannot occur with the loop seal system as they are immune to thermal and sediment distortion.

Reader Enquiry Service No. 7422

#### **Bulk Loading Spout from Aeronca International**

Aeronca International Limited are marketing through their Air Pollution Control Division a bulk loading spout which completely removes the dust problem caused when loading granular materials from hopper to tanker.

An integral hoist lowers the nozzle which "feels" its way into the loading hatch of the tanker by means of a probe, and the product is discharged from the hopper through the chute in the centre of the bulk loading spout. Displaced air and float dust from the tanker is exhausted through the spout into the dust filter usually placed on the loading platform.



The flexible tubing used in the manufacture of Aeronca Bulk Loading Spouts allows considerable movement without fear of splitting. The hoist can be powered by electricity, compressed air or hydraulics to suit each client's preference.

Reader Enquiry Service No. 7423

#### Personal Noise Monitor for Industry

Du Pont have now produced a European version of their audio dosimeter which has been successfully marketed in the U.S.A. since 1971 to industry and government agencies. This is a personal noise exposure monitor worn by an employee during the working day. The European version, the Du Pont E-100 Audio Dosimeter, designed specifically for British industry, measures all noise exposure between 80 and 115 dBA on the 3dB halving principle laid down in the I.S.O./R1999 standard and H.M. Factory Inspectorate Code of Practice.

The instrument is compact and lightweight: little bigger than a cigarette packet and weighing less than eight ounces. The power source comes from a nine-volt standard transistorised battery, and the unit fits into the employee's shirt pocket or clips to his belt. The microphone is worn on the shirt collar near to the ear; this minimises body shielding so that the actual sound level reaching the ear is picked up.

The microphone is a key component to sense the sound pressure level. It is piezoelectric type, as used on many sound level meters. Microphone output is fed into an "A" weighting filter which attenuates the sound. The signal is then true RMS detected and converted to a current signal which is inversely proportional to the permitted exposure time. The current flow is integrated on to a separate memory cell which is reusable and has a virtually unlimited life.

At the end of the shift the memory cell is removed from the dosimeter and inserted in the Du Pont desk-top readout device. Within ten seconds the worker's density noise exposure is displayed as a percentage of the allowable limit that has already been established. The memory cell is automatically cleared for reuse as the exposure information is retrieved. In addition to calculating percentage noise exposure, the instrument has a 115 dBA detector which constantly monitors the plating current to detect any continuous signal of one second or longer in excess of 115 dBA.

The separate readout device can service any number of dosimeters, and in most applications only one readout is necessary.



The noise exposure of the individual employee obtained with a dosimeter provides a far more accurate exposure profile than can be obtained with stationary or semi-portable survey type instruments. Exposure profiles can be established for employees who work for both intermittent and continuous exposure periods.

Reader Enquiry Service No. 7424

#### Atlantic Richfield Gas Strike in North Sea

Atlantic Richfield Company announced a natural gas discovery in a British North Sea exploratory well on 20th December 1973, approximately six miles northeast of the producing Leman Bank field.

ARCO Oil Producing Inc., London based subsidiary of Atlantic Richfield, is operator for the Arpet group of participants in the operation.

The well, no. 49/28-4, flowed gas on a test at the rate of 60 million cubic feet per day from the Permian Rotliegendes formation at an interval below 7,900 feet. The test was through a one and one-half inch choke.

The well was drilled to a total depth of 8,450 feet in 103 feet of water from the jack-up rig Britannia. The site is approximately 40 miles northeast of the Bacton terminal on the Norfolk coast.

A spokesman said the new discovery appears to be in an accumulation separate from the nearby Leman Bank field. Further testing will be required to determine the extent of gas reserves.

Reader Enquiry Service No. 7425

#### New IGCA Booklet

The Industrial Gas Cleaning Association, itself a member of NSCA, is a non-profit making Association, formed in the United Kingdom by leading Companies concerned in the design, manufacture and installation of industrial air pollution control equipment. The IGCA has produced a new booklet giving a brief summary of industrial air pollution problems and the equipment which is available to deal with them.

In the booklet, industrial atmospheric pollution is divided into two main categories, particulate and gaseous matter, and appropriate tools are listed under the headings: 1. Cyclone collectors 2. Wet collectors 3. Fabric filters 4. Electrostatic precipitators 5. Absorption processes 6. Adsorption processes and 7. Combustion processes, either flame or catalytic.

Each method is clearly described, with explanatory diagrams, but no attempt is made to give other than general information about the efficiency range of the different types of equipment. However, members of the IGCA can put their experience at the disposal of industry for the solution of most problems in air pollution control. With the many types of equipment they engineer, sell and service, an economically feasible answer can generally be provided. Additionally, the Association is fully qualified through its membership to make significant contributions and recommendations on Governmental matters affecting industrial air pollution control and the equipment industry which it represents.

Reader Enquiry Service No. 7426

# CLEAN AIR

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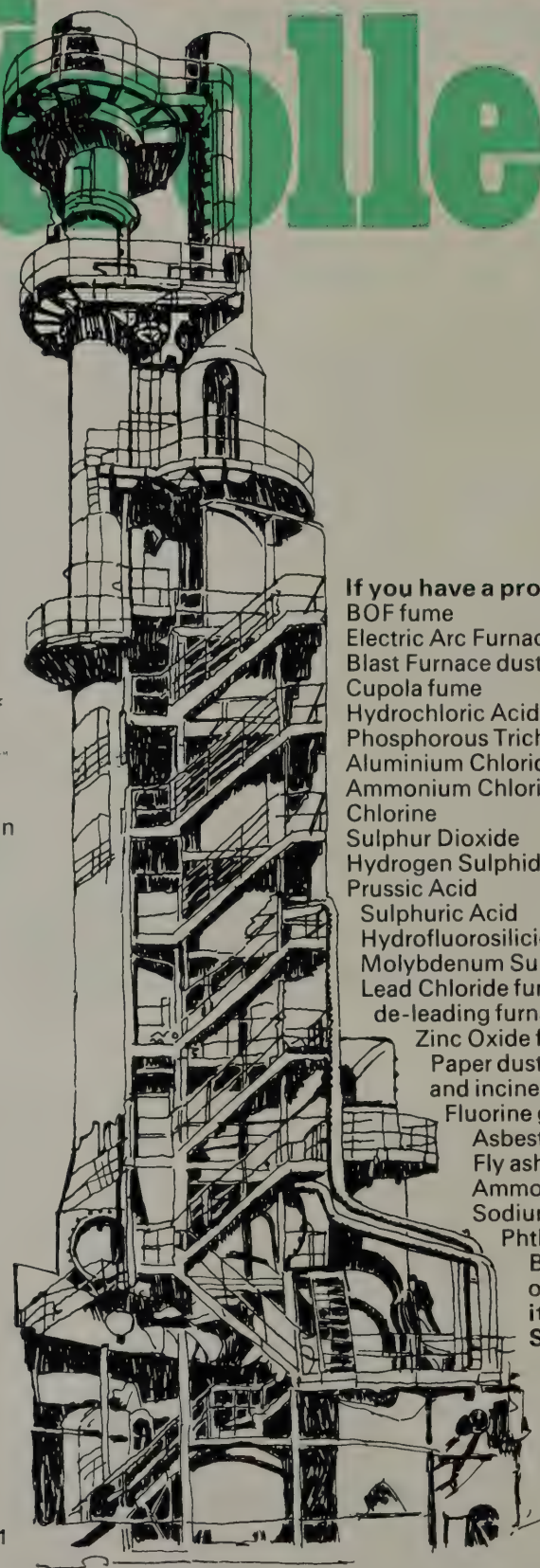
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**BRITAIN'S LEADING AIR POLLUTION JOURNAL**

# **CLEAN AIR**

*Incorporating "Smokeless Air"*

**SUMMER 1974**

**VOL. 4 NO. 14**

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**NSCA New Memorandum and Articles  
of Association and Bye-laws**

**Monitoring the Fallout of Grit and Dust  
Emitted by Industrial Sources,  
B. S. Armstrong and J. G. Beese**

**Comparison of Air Pollution Statistics,  
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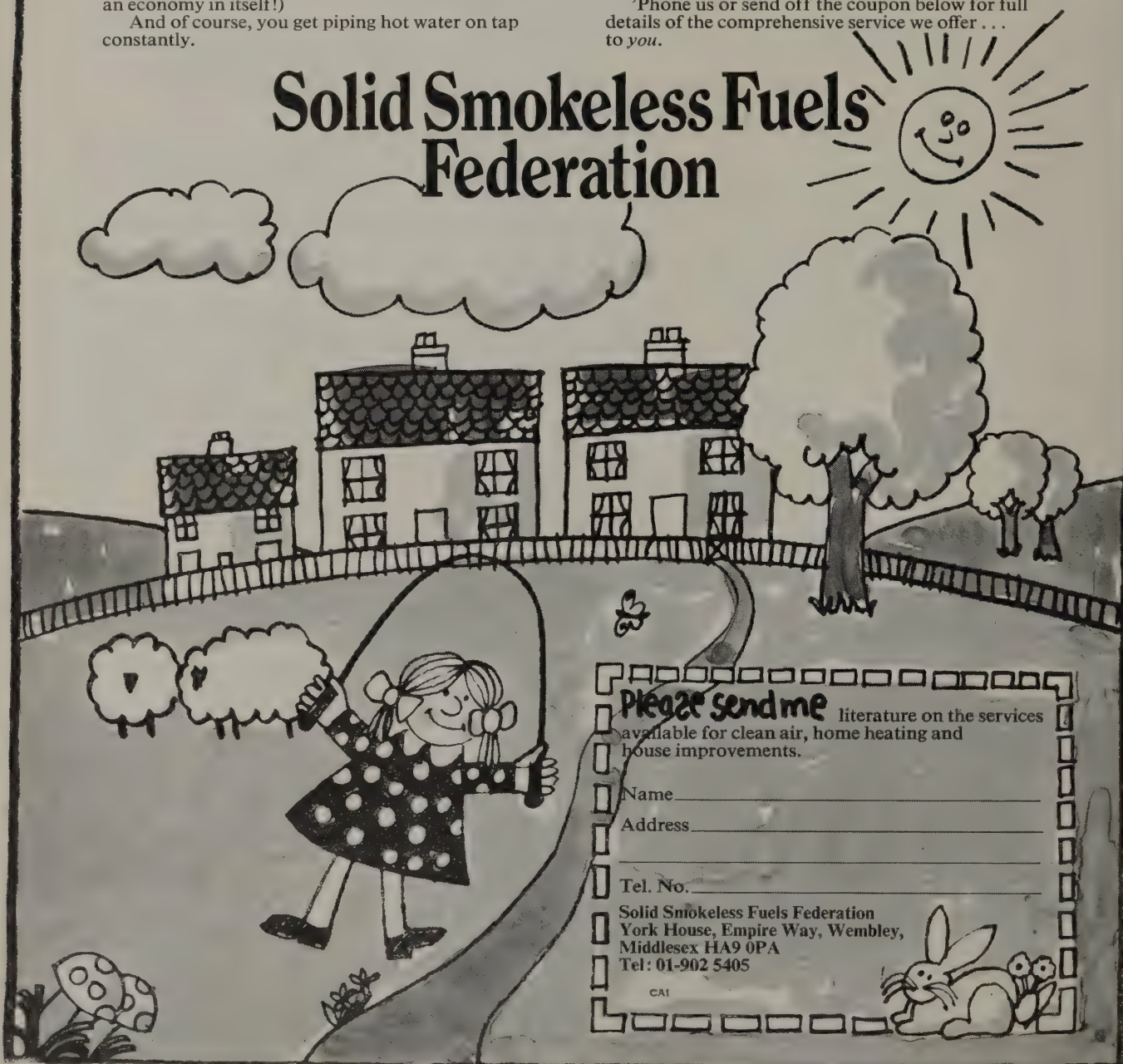
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# CLEAN AIR

## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

Vol. 4 No. 14

Summer 1974

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# National Society for Clean Air

## New Divisions



"This most excellent canopy, the air"

# CLEAN AIR

## The Society

At twelve noon on Friday 29th March, 1974 the Society held an Extraordinary General Meeting at the Friends Meeting House, Euston Road, London. At this meeting three Special Resolutions were unanimously adopted. The first Resolution amends and enlarges the Society's Memorandum of Association. The second Resolution alters the Articles of Association and the third Resolution accepts a complete new set of Bye-Laws. The adoption of these Resolutions at the General Meeting was the culmination of work which has been going on for over four years to fit the Society to deal with present day problems especially in the light of recent local government changes.

The new Memorandum of Association, the Articles of Association and the new Bye-laws are printed in full later in this journal.

Before considering what these changes are and what effect they are likely to have, it would be as well to remind ourselves, briefly, of the history of the Society and some of its achievements, and also to look at the background to the changes which have now been implemented.

In 1899 the Coal Smoke Abatement Society was founded in London. This was a Society comprising Individual Members who sought to bring influence to bear on "vestries", that is the local authorities, to take steps to abate the smoke in London. The Society was supported entirely by the subscriptions of its members but it was able to appoint its own smoke inspectors who carried out their work to some effect. Shortly after 1900 similar Societies were formed in Leeds, Manchester, Sheffield and Glasgow; and in 1909 these Societies together formed the Smoke Abatement League. Unlike the Coal Smoke Abatement Society the members of the Smoke Abatement League recruited their membership from local authorities and from industry. Nevertheless, the objects of the Society and of the League were generally similar and in 1929 they combined to form the National Smoke Abatement Society whose headquarters were established in Manchester. The membership of the new Society comprised the membership of the original founder members, and so consisted of local authorities, industries and individual members. In 1936 the Society moved its headquarters to London and in 1958 it became the National Society for Clean Air. The Society continued to operate from London until 1970 when the headquarters were moved to Brighton where they still are.

Through the years, the Society's achievements have not been inconsiderable and it is salutary to reflect that had it not been for the intervention of two world wars it seems highly probable that clean air legislation would have been introduced very much earlier than it was. Legislation was imminent in 1914. It was again imminent in 1939, but in the event it was not until 1956 that the first Clean Air Act was passed. Nevertheless, in the intervening years the Society was by no means idle. It was the Society which originated the idea of instituting classes where stokers, or firemen as they are sometimes called, could learn how to operate boiler plant properly so that fuel was burnt efficiently and in this way, smoke was reduced. The Society no longer runs such classes in England and Wales but continues to be represented on the examining panel of the Institute of City and Guilds who now conduct the examinations for qualification in this field. The classes for firemen, however, are still run by the Society in Glasgow.

The concept of the smokeless zone, now the smoke control area, was launched by the Society and was the original idea of one of its former Chairmen, Mr. Charles Gandy. Now all are familiar with smoke control areas and the idea has recently spread further in a slightly different field, and we have noise control areas as well. Following the smog of December, 1952, the Society was much engaged in presenting evidence to the Beaver Committee, in providing advisers and assessors to work with that Committee and indeed some members of the Committee were drawn from the ranks of the Society. Following the publication of the Beaver Report, the Society worked very closely with the late Sir Gerald Nabarro in the preparation of his Clean Air Bill. In the event, this Private Member's Bill was taken over by the then Government and introduced as a Government measure. Although changed in detail, it followed very much the lines of Nabarro's original Bill much of which was the work of the Society. Again, the Society was concerned with the preparation and helped to some extent with the drafting of the 1968 Clean Air Act which was introduced by Mr. Robert Maxwell. Since that time members of the Society and its Committees have realised a closer relationship with the Government and it is now rare if the Society is not represented on any Working Party or Committee set up by the

Government to consider legislation or operations in the field of clean air. The Society was represented on the Working Party which produced the Memorandum on Chimney Heights; it has been concerned with the Working Party on the Grit and Dust Regulations; the Society continues to be represented on the Working Party on Odours and was well represented on the Working Party which produced the Report on the Disclosure of Information Regarding Industrial Emissions to Atmosphere.

Turning now to more recent history regarding the re-formation of the Society, in 1969 the Executive Council were beginning to think of possible reconstruction of the Council and its Committees, to streamline administrative procedures, to organize the Society for the changes which had already been brought about by the 1956 and 1968 Clean Air Acts and to prepare for changes which seemed probable in the future. Two other problems were also pressing. The lease of the Society's premises in London was expiring and rents were going up. The staff had become rather ill-balanced and needed overhaul. The outcome was the formation of a small Steering Committee to examine the whole problem and to make recommendations about the three requirements. The Committee first met in February, 1970 and continued to meet at regular intervals for a period of twelve months. The first matter to be dealt with was that of premises and the Committee's deliberations eventually resulted in the move of the Society to Brighton in July, 1970. This move has undoubtedly proved successful, but it served to precipitate the necessity for staff changes in view of the fact that few of the staff at London were prepared to move to Brighton. It therefore became necessary to engage new staff and opportunity was taken to streamline the staff on the lines proposed by the Steering Committee and approved by the Executive Council.

There remained the important task of the reconstruction of the Society, of the Executive Council and its Committees. In dealing with this question, it was necessary first to decide whether or not the Society was going to broaden its horizons and deal with other things as well as clean air, for example water pollution and noise. There was much discussion on this and opinion was fairly evenly divided whether the Society should stick to its last and deal only with clean air or whether it should tend to branch out into other directions and embrace such matters as noise, water pollution and pollution of the land as they affected clean air and as the control of air pollution affected them.

At the time that this was going on in the Spring and Summer of 1970, the Maud Report on the reorganisation of local government was published, and it was clear that this would have to be taken into consideration in all deliberations on the future of the Society. This was duly done and in February, 1971 the Steering Committee made certain specific proposals. Before these proposals were considered by the Council however, they were circulated to all Divisions for comment. When these comments had been received, the matter was again considered but by this time the Maud Report had been discarded, and the then Government published its intentions about local government reform. It was therefore inopportune to consider reconstruction of the Society before the Government's ideas were known in detail.

In February, 1972 the Council appointed a Reconstruction Committee to reconsider the whole matter in the light of the recommendations of the original Steering Committee and in the light of the Local Government Bill. The considerable reduction in the number of local authorities throughout England and Wales would obviously be reflected in the membership of the Society. Through all this too, was the idea that there should be balanced representation from the local authorities, from industry, from learned societies and from individuals on the Council and on the Committees of the Society. At the same time Divisional Representation should, if anything, be increased. A further task was the possible revision of divisional boundaries. Undoubtedly some Divisions were too large, and other divisional boundaries would have to be redrawn to suit the new local government map, and this might mean the creation of more Divisions.

The Reconstruction Committee first met in February, 1972 and met regularly for a year to examine all these various questions. Specific proposals were made and these were sent to all Divisions for comment. The proposals were then slightly amended to take account of what the Divisions had to say and were placed before the Executive Council in June, 1973. The Council accepted these proposals with some minor amendments and as a result of this a revision of the Memorandum of Association, the Articles of Association and the Bye-laws of the Society was put in hand and submitted, through the Society's solicitors, to the Charity Commission, the Department of Trade and Industry and the Inland Revenue. Account was taken on the requirements of these authorities and, as has been stated earlier, the revised Memorandum, Articles and Bye-laws were adopted by the Society in General Meeting on the 29th March last.

As a result of this revision, the Society's name remains unchanged but its Terms of Reference have been slightly extended to allow for evolution and progress in the field of the control of air pollution and with the realisation that air pollution is a matter which cannot be dealt with in isolation. The new Article 3 in the Memorandum of Association lays particular stress on education in all its aspects and this will be an important consideration in the future.

The Executive Council now becomes the "Council of the Society" and it will be enlarged to allow for better representation from the Divisions, from National Bodies and from Individual Members. The Council will become more a policy-making body and debate matters of importance and pass the more detailed work to the Committees. This will mean more work for the Committees and the new "Subject Groups" which it is intended to form. So far as the Divisions themselves are concerned, there has been some revision of Divisional Boundaries to take note of the new local government map and two new Divisions have been created in England. This has inevitably meant some alteration in the numbers of Divisional Representatives to the Council. In future, too, Divisions will be more directly responsible for the election of Divisional Representatives. There will be no central postal ballot but Divisions will elect their Representatives at Divisional Annual General Meetings.

It will obviously be some time before all these changes have full effect, but they are already being implemented gradually and the important thing is that the work of the Society should carry on without interruption. Already steps have been taken to try and re-recruit all the new local authorities, both County and District, and the response so far has not been unfavourable. Nevertheless it will be a few months before we really know who our local authority members are and this will obviously have an effect on Divisional Councils and upon representation on the Council of the Society. In the past, the strength of the Society has been its success in bringing together of representatives of local authorities, of industry, of the learned societies and individual members. This has provided a forum where matters can be thoroughly debated and where it has been possible to develop a responsible attitude which has ensured a good relationship and standing with central government. This sense of responsibility and good relationship with government are assets which must be jealously safeguarded as they will help to provide the foundations for the future.

The new District Councils are now responsible for "clean air" and this a lot more than "smoke control". Counties, although not directly responsible for environmental health matters, nevertheless are responsible for waste disposal and perhaps in some cases it is not yet fully realised how far reaching this matter of waste disposal can be in the fields of the environment and environmental health. But the County Authorities are responsible for education; and education about the environment, about clean air and the control of pollution are of ever increasing importance. Every day the Society is asked to provide information to schools and to schoolchildren on these very important subjects. It is therefore to be hoped that the County Authorities will realise their full responsibilities in these matters and will support the Society accordingly.

In its turn, the Society's task will be to help all its members to carry out their tasks by providing information, advice and education, education which will stretch from that of a child at a primary school to that of the District and County Councillor in the particular matters for which he is responsible. This is very much what the Society has done in the past, but to meet the new requirements there will have to be a distinct increase in Society activities in the way of conferences, seminars and the like, and in the production of suitable literature specially designed for those it is intended to reach.

On the other side of the coin, the members and the Divisions of the Society must themselves take on the task of keeping the Council informed of what they need, and they must also help by providing services in the field. It is foreseen that there will be a requirement for a stepping-up of Divisional activity. More meetings for the general public will be required, and provision must be made for better liaison with schools and for the provision of speakers who will be prepared not only to talk to schools but also to give lectures to other interested organisations. Industry, too, must not be neglected and it is hoped that Divisions will use every opportunity to arrange visits to industries in their areas.

The Society has now achieved its new look and the foundations have been laid for, at any rate, the next decade. It is up to all members of the Society to work together, as indeed they have done in the past, to ensure that the future is a bright one.

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## ANNUAL GENERAL MEETING

The Society's Annual General Meeting will be held at 14.00 on Wednesday, 3rd July 1974 at:

The Connaught Rooms,  
Great Queen Street,  
London W.C.2.

*This will be followed at 15.00 by:*

### A PUBLIC MEETING

at which the address will be given by SIR BRIAN FLOWERS, FRs., Chairman of the Royal Commission on Environmental Pollution.

TEA will be served after the meeting.

## YESTERDAY'S SUMMER

The kids in a city of dirt and grime  
They kick a can through windblown papers.  
The cough of the man who never smokes  
As the fumes of cars rise around and blanket the world  
in a dark cloud.

It's no good fishing in that river boy,  
Can't you see the fish dead by the foam.  
The detergents floating on liquid black,  
With the cans and bottles empty, left to litter and ruin  
the summer we had.

Green fields, rolling hills,  
Clouds floating in gentle blue skies.  
A sweet smell of mown hay,  
Lazing by river of cool, clear water.  
But that was yesterday's summer.

Susan Rickard (age 14)

## The Sulphur Dioxide Problem Unsolved

Middlesex Polytechnic are holding a colloquium on air pollution, entitled 'The Sulphur Dioxide Problem Unsolved', at Hendon on June 26th, 1974.

The programme has been designed specifically to meet the needs of public health inspectors and will include 'Report on the National Survey of Clean Air' by Mrs. M. L. Weatherley (Warren Spring Laboratory), 'Dispersion and Dispersion Modelling' by Mr. C. F. Barrett (Warren Spring Laboratory) and 'Methods of Controlling SO<sub>2</sub> Emissions' by Mr. G. H. Haggard (Middlesex Polytechnic).

A fee of £5 will be charged for each delegate, this to include morning and afternoon refreshments, a buffet luncheon and a set of course notes.

For further information please contact: The Short Course Secretary, Middlesex Polytechnic, Queensway, Enfield, Middlesex. Telephone: 01-804 8131, Ex. 23.

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## THE NATIONAL SOCIETY FOR CLEAN AIR

### 41st ANNUAL CONFERENCE

### CARDIFF

14th-18th October, 1974

#### Opening Session—Monday 14th October. The City Hall.

20.30 The Conference will be opened by Mr. David Gibson-Watt, M.C., M.P. The President will deliver the annual address.

#### Session Two—Tuesday 16th October. The New Theatre.

a.m. New Legislation (The Local Government Act, The Protection of the Environment Bill, The Water Act, 1973, etc.) and its implications and effects on Local Authorities, Regional Water Authorities. etc. W. Bate, M.B.E. (*Chief Public Health Inspector, Cardiff*).

#### Session Three—Tuesday 16th October. The New Theatre.

p.m. Environmental Pollution: The Technical Aspects of Co-operation between Industry and the Local Authority—Dr. Roland Jenkins (*B.P. Chemicals International Ltd., Port Talbot*).

#### Session Four—Wednesday 16th October. The New Theatre.

a.m. Environmental Pollution: Road Traffic  
(a) Noise—T. W. Heppell (*Building Research Establishment, D.O.E.*).  
(b) Preliminary Findings of the Five Towns Survey—Dr. R. G. Derwent and Dr. H. N. Stewart (*Warren Spring Laboratory, D.T.I.*).

#### Session Five—Thursday 17th October. The New Theatre.

a.m. The Prevention of Pollution from Industry.  
(a) The Coal Industry—Mr. David Broadbent (*National Coal Board*).  
(b) The Steel Industry—Dr. A. O'Connor (*British Steel Corporation*).

#### Open Session—Thursday 17th October. The New Theatre.

p.m. Wild Life and the Effects of Pollution—Dr. K. Mellanby, C.B.E. (*National Environmental Research Council, Monks Wood Experimental Station*).

#### Session Seven—Friday 18th October. The New Theatre.

a.m. The Measurement of Heavy Metals in the Atmosphere and their Interpretation.  
(a) Mr. N. J. Pattenden (*A.E.R.E., Harwell*).  
(b) Prof. G. T. Goodman, Dr. G. D. Parry, Mr. S. Smith and Mr. M. J. Inskip (*Chelsea College, University of London*).

Delegates Fee £25.00+£2.50 V.A.T.

Full details and conference brochure available from:—  
136 North Street, Brighton, BN1 1RG. Telephone Brighton 26313

# The National Society for Clean Air

## New Memorandum and Articles of Association and Bye-laws

The National Smoke Abatement Society, formed in 1929 by the amalgamation of the Coal Smoke Abatement Society (1899) and the Smoke Abatement League of Great Britain (1909), became incorporated and assumed the name National Society for Clean Air on 1st January, 1958. It is licensed by the Department of Trade and Industry to omit the word "Limited" from its name.

THE COMPANIES ACTS, 1948 TO 1967  
COMPANY LIMITED BY GUARANTEE AND NOT  
HAVING A SHARE CAPITAL

### MEMORANDUM OF ASSOCIATION OF THE NATIONAL SOCIETY FOR CLEAN AIR

1. The name of the Company (hereinafter called "the Society") is "The National Society for Clean Air".
  2. The registered office of the Society will be situate in England.
  - 3.(1) The object for which the Society is established is to promote public education in all matters relating to the value and importance of clean air and methods and consequences of air pollution control and forms of pollution control.
  - (2) In furtherance of the foregoing object but not further or otherwise the Society shall have the following powers:
    - (A) To initiate, assist, promote and encourage the investigation, consideration and discussion of all forms of pollution in order to achieve its reduction or prevention, and to undertake, or support or aid the undertaking of, investigations and research relevant to the causes and effects of pollution and the means to prevent it and to publish the results of such research.
    - (B) To promote by meetings, publications, exhibitions, the delivery of lectures and addresses, the display of pictures, cinematograph films and models and by other means the collection and dissemination of knowledge about pollution, its causes and effects, and the means to prevent it.
    - (C) To encourage the adoption of methods to reduce and prevent pollution.
    - (D) To promote, assist, support, or oppose, as may be consistent with the objects for which the Society is established, any administrative or other measures or proposed measures affecting pollution.
    - (E) To initiate, support and co-operate with others in proposals and activities calculated to assist the promotion of the Society's objects.
    - (F) To establish, and support or aid in the establishment and support of any charitable associations or institutions and to subscribe or guarantee money for charitable purposes in any way connected with the Society's purposes or calculated to further its objects.
    - (G) To purchase, take on lease or in exchange, hire or otherwise acquire any real or personal property and any rights or privileges which the Society may think necessary or convenient for the promotion of its objects, and to construct, maintain and alter any buildings or erections necessary or convenient for the work of the Society.
    - (H) To sell, let, mortgage, dispose of or turn to account all or any of the property or assets of the Society as may be thought expedient with a view to the promotion of its objects.
    - (I) To undertake and execute any trusts which may lawfully be undertaken by the Society and may be conducive to its objects.
    - (J) To borrow or raise money for the purposes of the Society and subject to this Memorandum of Association on such terms and on such security as may be thought fit.
    - (K) To invest the moneys of the Society not immediately required for its purposes in or upon such investments, securities or property as may be thought fit, but so that moneys subject or representing property subject to the jurisdiction of the Charity Commissioners for England and Wales shall only be invested in such securities and with such sanction (if any) as may for the time being be prescribed by law.
    - (L) If and when considered advisable, to take all such measures as may be necessary to convert the Society into a body specially incorporated by Royal Charter or otherwise, or to secure the creation of a new body so incorporated with the object of carrying out the purposes of the Society and continuing the work thereof.
    - (M) To take all such other steps as will further the attainment of the above objects or any of them.
- PROVIDED FIRST that, notwithstanding anything contained in the preceding paragraphs of this Clause, the objects of the Society shall be restricted to such only of the objects aforesaid as are according to the law of England exclusively charitable.
- PROVIDED SECONDLY that the Society's objects shall not extend to regulation of relations between workers and employers or organisations of workers and organisations of employers.
- PROVIDED THIRDLY that in case the Society shall take or hold any property subject to the jurisdiction of the Charity Commissioners for England and Wales or the Secretary of State for Education and Science, the Society shall not sell, mortgage, charge or lease the same without such authority, approval or consent as may be required

by law and as regards any such property the Council of the Society (hereinafter called "the Council") shall be chargeable for any such property that may come into their hands and shall be answerable and accountable for their own acts, receipts, neglects and defaults, and for the due administration of such property in the same manner and to the same extent as the Council would have been if no incorporation had been effected, and the incorporation of the Society shall not diminish or impair any control or authority exercisable by the Chancery Division, the Charity Commissioners or the Secretary of State for Education and Science over the Council but they shall as regards any such property be subject jointly and severally to such control or authority as if the Society were not incorporated. In case the Society shall take or hold any property which may be subject to any trusts, the Society shall only deal with the same in such manner as allowed by law, having regard to such trusts.

4. The income and property of the Society, whencesoever derived, shall be applied solely towards the promotion of the objects of the Society as set forth in this Memorandum of Association and no portion thereof shall be paid or transferred directly or indirectly, by way of dividend, bonus or otherwise howsoever by way of profit, to the members of the Society.

PROVIDED that nothing herein shall prevent the payment, in good faith, of reasonable and proper remuneration and pension to any officer or servant of the Society in return for any services actually rendered to the Society, nor prevent the payment of interest at a rate of 6% per annum on money lent or reasonable and proper rent for premises demised or let by any member to the Society nor prevent the gratuitous distribution among, or sale at a discount to, subscribers to the funds of the Society of any books or other publications, whether published by the Society or otherwise, relating to all or any of the Society's objects above set forth; but so that no member of the Council shall be appointed to any salaried office of the Society or any office of the Society paid by fees, and that no remuneration or other benefit in money or money's worth shall be given by the Society to any member of the Council, except repayment of out-of-pocket expenses and interest at the rate aforesaid on money lent or reasonable and proper rent for premises demised or let to the Society; provided that the provision last aforesaid shall not apply to any payment to any company of which a member of the Council may be a member, and in which such member shall not hold more than one hundredth part of the capital, and such member shall not be bound to account for any share of profits he may receive in respect of any such payment.

5. No addition, alteration or amendment shall be made to or in the provisions of the Memorandum or Articles of Association of the Society for the time being in force unless the same shall have been previously submitted to and approved by the Department of Trade.
  6. The fourth and fifth paragraphs of this Memorandum of Association contain conditions on which a licence is granted by the Board of Trade to the Association in pursuance of section 19(1) of the Companies Act 1948.
  7. The liability of the members is limited.
  8. Every member of the Society undertakes to contribute to the assets of the Society, in the event of the same being wound up while he is a member, or within one year after he ceases to be a member, for payment of the debts and liabilities of the Society contracted before he ceases to be a member, and of the costs, charges and expenses of winding-up, and for the adjustment of the rights of the contributories among themselves, such amount as may be required not exceeding 5s (25p).
  9. If upon the winding up or dissolution of the Society there remains, after the satisfaction of all its debts and liabilities, any property whatsoever, the same shall not be paid to or distributed among the members of the Society, but shall be given or transferred to some other charitable institution or institutions having objects similar to the objects of the Society, and which shall prohibit the distribution of its or their members to an extent at least as great as is imposed on the Society under or by virtue of Clause 4 hereof, such institution or institutions to be determined by the members of the Society at or before the time of dissolution, and if and so far as effect cannot be given to such provision, then to some charitable object.
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THE COMPANIES ACTS, 1948 to 1967  
COMPANY LIMITED BY GUARANTEE AND NOT  
HAVING A SHARE CAPITAL

ARTICLES OF ASSOCIATION  
OF  
THE NATIONAL SOCIETY FOR CLEAN AIR

**DEFINITIONS**

1. In these presents the words standing in the first column of the Table below shall bear the meaning set opposite to them respectively in the second column thereof, if not inconsistent with the subject or context:—

<i>Words</i>	<i>Meaning</i>
The Act of 1948 .. .. .	The Companies Act, 1948.
The Act of 1967 .. .. .	The Companies Act, 1967.
The Acts .. .. .	The Companies Act, 1948 and the Companies Act, 1967.
The Bye Laws .. .. .	The Bye Laws of the Society from time to time in force.
These presents .. .. .	These Articles of Association.
The Society .. .. .	The above named Society.
The Council .. .. .	The Council for the time being of the Society.
The Office .. .. .	The registered office of the Society.
The Seal .. .. .	The common seal of the Society.
The United Kingdom .. .. .	Great Britain and Northern Ireland.
Month .. .. .	Calendar month.
In writing .. .. .	Written printed or lithographed, or partly one and partly another, and other modes of representing or reproducing words in a visible form.
The Secretary General .. .. .	The Secretary for the time being or any person appointed to perform the duties of Secretary of the Society, in accordance with the Acts.
Representative of a member .. .. .	A Representative of a Local Authority or Corporate Member appointed under Article (4d) or (e), and whose appointment has been duly notified to the Secretary General.
Delegate .. .. .	A Representative of a Corporate Member having a Branch or Section situated in a Division other than that Division in which the address of the Corporate Member is situated appointed by the Corporate Member to represent its local interests in the particular Division in which its Branch or Section is situated.

And words importing the singular number only shall include the plural number, and vice versa.

Words importing the masculine gender only shall include the feminine gender and vice versa and

Words importing persons shall include corporations.

Subject as aforesaid, any words or expressions defined in the Acts or any statutory modification thereof in force at the date on which these presents become binding on the Society shall, if not inconsistent with the subject or context, bear the same meanings in these presents.

**MEMBERSHIP**

2. The number of members with which the Society is registered is unlimited.

3. The provisions of section 110 of the Act of 1948 shall be observed by the Society and every member of the Society, other than Honorary Members, shall either make a written request to become a member (which request may be included in his application for membership made in accordance with Article 4(i) of these presents) or sign a written consent to become a member or sign the register of members on becoming a member.

4.(a) The members of the Society shall be the persons who are Members of the Society and such other persons as the Council shall from time to time elect or recommend to the Society for election.

(b) The Society shall consist of a President, Vice-Presidents, Secretary General, Honorary Members, Individual Members, Local Authority Members, Corporate Members and Student Members. The Society may also have a Patron or Patrons as hereinafter mentioned.

**Classes of Membership**

**INDIVIDUAL MEMBERS**

(c) (i) Any Individual who supports the objects of the Society shall be eligible for admission as an Individual Member.

(ii) On the attainment of the age of 65, Individual Members may, at the discretion of the Council, retain their membership as Individual Members of the Society on payment of a fixed sum as prescribed in the Bye-Laws of the Society.

**LOCAL AUTHORITY MEMBERS**

(d) (i) Any Local Authority supporting the objects of the Society shall be eligible for admission as a Local Authority Member. A Local Authority Member shall be entitled from time to time to appoint, and to revoke the appointment of not more than four Representatives. Each of the Representatives of a Local Authority Member shall be entitled to exercise on its behalf the same rights as an Individual Member and (if not himself an Individual Member) shall, by virtue of his appointment as such Representative be eligible for election or appointment to any office of the Society or to membership of the Council.

(ii) For the purpose of this Article, the designation "Local Authority" shall be deemed to include "Health Authorities" and "Water Authorities" or such other like authorities as the Council shall from time to time admit for membership.

#### CORPORATE MEMBERS

- (e) (i) Any Society, Institution, Company, Association, Board or Group or educational establishment being in every case an incorporated body supporting the objects of the Society shall be eligible for admission as a Corporate Member. A Corporate Member shall be entitled to appoint Representatives according to subscription as set out in the Bye-Laws, and any such Representatives shall be entitled to exercise on its behalf the same rights as an Individual Member, and (if not himself an Individual Member) shall, by virtue of his appointment as such Representative, be eligible for election or appointment to any office of the Society or to membership of the Council.
- (ii) An unincorporated body (including a firm) may not as such become a member of the Society, but if it desires to obtain the advantages of membership it may nominate Representatives (determined according to subscription as aforesaid) to apply in its name for membership and exercise the rights of membership on its behalf. Every person so applying for membership shall be subject to the same rules and regulations as to admission and otherwise as any person not so nominated, and shall if admitted have the same rights and be subject to the same liabilities and incidents as any Individual Member except that (i) such persons shall be liable to pay such annual subscription as is appropriate to a Corporate Member (ii) if his nomination is revoked by such body he shall cease to be a member. References in these presents or in the Bye-Laws to Corporate members shall as far as the context admits include references to unincorporated bodies having nominated representative members provided always that no such body shall as such have any rights of voting or otherwise or be deemed for any purpose to be a member of the Society.

#### SUSTAINING MEMBERS

- (f) Any member who subscribes not less than the sum as prescribed in the Bye-Laws for this class of membership shall be eligible for admission as a Sustaining Member.

#### HONORARY MEMBERS

- (g) Individuals who have rendered outstanding service in promoting the objects of the Society shall be eligible for admission as Honorary Members and such persons, being duly admitted shall enjoy all the privileges of membership (including the right to vote) except that they shall not by virtue of their Honorary Membership alone be deemed to be members of the Society for the purposes of registration within the meaning of Article 3 of these presents or be entered on the Register of members of the Society or be entitled to vote on a special or extraordinary resolution or be under any liability for the debts and liabilities of the Society.

#### STUDENT MEMBERS

- (h) Any bona fide non-graduate student pursuing a course of study at school, college or university shall be eligible for admission as a Student Member on payment of the subscription prescribed in the Bye Laws.

#### APPLICATION FOR MEMBERSHIP

- (i) Every person wishing to join the Society and eligible for election as a Member, must apply in writing and shall deposit with such application the first annual subscription which shall be returned in the event of non-election.

#### RESIGNATION OF MEMBERS

- (j) (i) Every member duly elected shall continue as such until he shall resign by notice in writing, to the Secretary General, such notice being accompanied by any monies due to the Society.
- (ii) The Council shall have the power to remove any member:
- whose annual subscription has remained unpaid for two successive years, or
  - who, in the opinion of the Council has acted in a manner prejudicial to the interests and objects of the Society or has behaved in such a manner as to render his further membership detrimental to the interests of the Society, or
  - at its sole discretion without assigning any reason therefore.

Provided that in every case the Member concerned shall have the opportunity to make representations defending his conduct in writing to the Council.

#### ANNUAL SUBSCRIPTIONS

- (k) The Council shall make Bye-Laws from time to time to fix annual subscriptions payable by the various classes of Members. The Bye-Laws shall be confirmed by the Society in General Meeting.

#### ANNUAL GENERAL MEETING

5. The Society shall hold a General Meeting in every calendar year as its Annual General Meeting at such time and place as may be determined by the Council, and shall specify the Meeting as such in the notices calling it, provided that every Annual General Meeting shall be held not more than fifteen months after the holding of the last preceding Annual General Meeting.

#### EXTRAORDINARY GENERAL MEETINGS

6. All General Meetings, other than Annual General Meetings, shall be called Extraordinary General Meetings.
7. The Council may whenever they think fit convene an Extraordinary General Meeting, and Extraordinary General Meetings shall also be convened on such requisition, or in default may be convened by such requisitionists, as provided by section 132 of the Act of 1948.

## NOTICE OF MEETINGS

8. Twenty-one days' notice in writing at the least of every Annual General Meeting and of every Meeting convened to pass a Special Resolution, and fourteen days' notice in writing at the least of every other General Meeting (exclusive in every case both of the day on which it is served or deemed to be served and of the day for which it is given), specifying the place, the day and the hour of meeting, and in the case of business other than routine business the general nature of that business, shall be given in manner hereinafter mentioned to such persons (including the Auditors) as are under these presents or under the Act entitled to receive such notices from the Society; but with the consent of all the members having the right to attend and vote thereat, or of such proportion of them as is prescribed by the Act in the case of meetings other than Annual General Meetings, a meeting may be convened by such notice as those members may think fit.

9. The accidental omissions to give notice of a meeting to, or the non-receipt of such notice by, any person entitled to receive notice thereof shall not invalidate the proceedings at such meetings.

## PROCEEDINGS AT GENERAL MEETINGS

10. Routine business shall mean and include only business transacted at an Annual General Meeting of the following classes, that is to say:—

- (a) Reading and considering the accounts and balance sheet and the annual reports of the Council and the Auditors.
- (b) Appointing Auditors and fixing their remuneration.
- (c) Receiving the results of the elections of the Council and other Officers.

11. No business shall be transacted at any General Meeting unless a quorum is present when the meeting proceeds to business. Save as herein otherwise provided ten members or Representatives of members personally present shall be a quorum.

12. If within half an hour from the time appointed for the holding of a General Meeting a quorum is not present, the meeting, if convened on the requisition of members, shall be dissolved. In any other case it shall stand adjourned to the same day in the next week, at the same time and place, or at such other place as the Council may determine, and if at such adjourned meeting a quorum is not present within half an hour from the time appointed for holding the meeting the members present shall be a quorum.

13. The Chairman (if any) of the Council shall preside as Chairman at every General Meeting, but if there be no such Chairman, or if at any meeting he shall not be present within fifteen minutes after the time appointed for holding the same, or shall be unwilling to preside, the members present shall choose one of the Deputy Chairmen or some other member of the Council, or if no such member be present, or if all the members of the Council present decline to take the chair, they shall choose some member or Representative of a member of the Society who shall be present to preside.

14. The Chairman may, with the consent of any meeting at which a quorum is present (and shall if so directed by the meeting) adjourn the meeting from time to time, and from place to place, but no business shall be transacted at any adjourned meeting other than business which might have been transacted at the meeting from which the adjournment took place. Whenever a meeting is adjourned for thirty days or more, notice of the adjourned meeting shall be given in the same manner as of an original meeting. Save as aforesaid, the members shall not be entitled to any notice of an adjournment, or of the business to be transacted at an adjourned meeting.

15. At any General Meeting a resolution put to the vote of the meeting shall be decided on a show of hands, unless a poll is, before or upon the declaration of the result of the show of hands, demanded by the Chairman or by at least five members or Representatives of members present in person or by proxy, or by members or Representatives of members present in person or by proxy and representing not less than one-tenth of the total voting rights of all the members and Representatives of members having the right to vote at the meeting, and unless a poll be so demanded a declaration by the Chairman of the meeting that a resolution has been carried, or carried unanimously or by a particular majority or lost, or not carried by a particular majority, and an entry to that effect in the minute book of the Society shall be conclusive evidence of the fact without proof of the number or proportion of the votes recorded in favour of or against that resolution. The demand for a poll may be withdrawn.

16. Subject to the provisions of Article 17, if a poll be demanded in manner aforesaid, it shall be taken at such time and place, and in such manner, as the Chairman of the meeting shall direct, and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was demanded.

17. No poll shall be demanded on the election of a Chairman of a meeting or on any question of adjournment.

18. In the case of an equality of votes, whether on a show of hands or on a poll, the Chairman of the meeting shall be entitled to a second or casting vote.

19. The demand of a poll shall not prevent the continuance of a meeting for the transaction of any business other than the question on which a poll has been demanded.

## VOTES OF MEMBERS

20. Subject as hereinafter provided, every member shall have one vote. A Local Authority Member or Corporate Member shall have one vote for each of its Representatives which shall be exercisable by such Representatives in person.

21. Except in accordance with Articles 4(g) and 29, and unless the Council otherwise determine, no member other than a member duly registered, who shall have paid every subscription and other sum (if any) which shall be due and payable to the Society, in respect of his membership, shall be entitled to vote on any question either personally through its Representatives or by proxy, or as a proxy for another member at any General Meeting.

22.(a) Votes may be given on a poll either personally or by proxy. A proxy need not be a member.

(b) The instrument appointing a proxy shall be in writing under the hand of the appointer, or his attorney duly authorized in writing, or if such appointer is a corporation under its common seal, if any, and if none, then under the hand of some officer duly authorized in that behalf. In the case of a Representative of a member any proxy shall be appointed by the member itself or its attorney and not by the Representative.

(c) The instrument appointing a proxy and the power of attorney or other authority (if any) under which it is signed or a notarially certified or office copy thereof shall be deposited at the office not less than 48 hours before the time appointed for holding the meeting or adjourned meeting at which the person named in the instrument proposes to vote,

or in the case of a poll not less than 24 hours before the time appointed for the taking of the poll, and in default the instrument of proxy shall not be treated as valid. No instrument appointing a proxy shall be valid after the expiration of 12 months from the date of its execution.

(d) A vote given in accordance with the terms of an instrument of proxy shall be valid notwithstanding the previous death or insanity of the principal or revocation of the proxy or of the authority under which the proxy was executed, provided that no intimation in writing of the death, insanity or revocation as aforesaid shall have been received at the office before the commencement of the meeting or adjourned meeting at which the proxy is used.

(e) An instrument appointing a proxy shall be in the common form or in such other form as the Council may accept, and shall be deemed to confer authority to demand or join in demanding a poll.

### **HONORARY OFFICERS**

23. The Officers of the Society shall consist of a President, Honorary Treasurer, Chairman and two Deputy Chairmen of the Council, and may also include a Patron or Patrons as hereinafter mentioned.

### **PATRON**

24. The Council may accept the patronage of any person or persons and shall thereupon elect such person or persons to be the Patron or Patrons of the Society for life or for such period as the Council may determine.

### **PRESIDENT**

25. The President shall be elected annually by the Society under the Bye-Laws. No person shall hold the office of President for more than two years in succession.

### **HONORARY TREASURER**

26. The Honorary Treasurer shall be elected annually by the Society under the Bye-Laws. The Honorary Treasurer shall be responsible for the uninvested funds of the Society and he shall cause all necessary and proper accounts to be kept in accordance with Article 47 hereof.

### **VICE-PRESIDENTS**

27.(a) Any person may be appointed by the Society as a Vice-President, provided that he or she is:

- (i) A person distinguished by his or her work in relation to pollution control, or
- (ii) A person deserving of honour for services rendered to the Society or whose association with the Society is for other reasons desirable.

(b) Vice-Presidents shall not exceed six in number.

(c) The term of office of a Vice President shall not exceed three years at the end of which term he may, if he so agrees, be re-elected to the office.

### **CHAIRMAN AND DEPUTY CHAIRMEN**

28. The Chairman and Deputy Chairmen shall be elected annually by the Council from its own members at its first meeting after the Annual General Meeting.

29. The Patron or Patrons (if any) of the Society, the President of the Society, and the Vice-Presidents shall enjoy all the rights of membership (including the right to vote) during their term of office except that they shall not by virtue of their office alone be deemed to be members of the Society for the purposes of registration within the meaning of Article 3 of these presents or be entered on the Register of Members of the Society or be entitled to vote on a special or extraordinary resolution or be under any liability for the debts and liabilities of the Society.

### **THE COUNCIL**

30. Subject as hereinafter provided, the members of Council shall not be less than 20 in number. The Society may, by Ordinary Resolution from time to time, increase or reduce the minimum number of members of the Council. The Council may act notwithstanding any vacancies in their body, but if the members of the Council shall be reduced in number to less than that required for a quorum for their meetings, they may act as the Council for the purpose only of summoning a general meeting of the Society.

31. The Council shall consist of the Patron or Patrons (if any), the President, the immediate Past President, the Honorary Treasurer, the immediate past Chairman, a number of Divisional Representatives elected as hereinafter provided; and not more than a like number of other persons consisting of Representatives of National or similar organisations which are Corporate Members of the Society, at the invitation of the Council. No person other than a member of the Society or a Representative of a member may be appointed a member of the Council. The Council may from time to time and at any time appoint any member of the Society or a Representative of a member as a member of the Council, either to fill a casual vacancy or by way of addition to the Council. Any member so appointed shall retain his office only until the next Annual General Meeting, but he shall be eligible for re-election or re-appointment.

The term "National or similar organisation" shall refer to any institution, association, society or board or other similar organisation, the activities of which extend to the whole of the United Kingdom, or to England, Scotland, Wales or Northern Ireland, and which is accepted by the Council as a National or similar organisation for the purposes of these presents.

### **APPOINTMENT AND RETIREMENT OF MEMBERS OF THE COUNCIL**

32.(a) The members and Representatives of members of each Division shall elect annually from among their number Representatives to be members of the Council. Divisional Representatives shall be elected to the Council for a period of three years. One-third of the elected members shall retire in rotation each year; such members shall be eligible for re-election. The number of Divisional Representatives to be elected by each Division shall each year be determined by the Council.

(b) A National or similar organisation shall be entitled to nominate annually one Representative for Membership of the Council under Article 31.

(c) The elected members of the Council shall (unless re-elected) vacate office after three years in accordance with the provisions of Article 32(a).

33. The Office of a member of the Council shall be vacated:—

- (a) If he ceases to be a member or a Representative of a member of the Society;
- (b) If by notice in writing to the Society he resigns his office;
- (c) If a receiving order is made against him or he make any arrangement or composition with his creditors;
- (d) If he becomes of unsound mind;
- (e) If he ceases to hold office by reason of any order made under Section 188 of the Act of 1948.
- (f) If he is removed from office by a Resolution duly passed pursuant to Section 184 of the Act.

34. A member of the Council who has attained the age of seventy shall be eligible for election and the provision of subsections (1) and (2) of Section 185 of the Act of 1948 shall not apply.

## POWERS OF THE COUNCIL

35. The Management of the Society shall be in the hands of the Council who may pay all expenses incurred in forming and registering the Society and may exercise all such powers of the Society as are not by the Act of 1948 or by these presents required to be exercised by the Society in General Meeting, subject nevertheless to any regulations of these presents, to the provisions of the Act of 1948, and to such regulations (not inconsistent with the aforesaid regulations or provisions) as may be prescribed by the Society in General Meeting, but no regulation so made by the Society shall invalidate any prior act of the Council which would have been valid if such regulations had not been made. The general powers given by this Article shall not be limited or restricted by any special authority or power given to the Council by any other Article.

36. (i) The Council shall, as necessary, make and recommend the adoption, alteration and revocation the Bye-Laws for the regulation of the Society and otherwise for the furtherance of the purposes for which the Society is established, provided that the Bye-Laws are not repugnant to the Memorandum of Association or these presents. Such recommendations of the Council shall be laid before the Society at the following Annual General Meeting or at an Extraordinary General Meeting called for that purpose for adoption, if thought fit, by Ordinary Resolution. The Bye-Laws for the time being in force shall be binding upon all members until varied or set aside as hereinbefore provided. It is expressly declared that, without prejudice to the powers of the Society to adopt Bye-Laws on other matters, the following shall be deemed to be matters which (so far as not governed by, and subject always to the provisions of, these presents) may be governed by Bye-Laws within the meaning of this article, that is to say:

- (a) As to entrance fees (if any) payable in respect of membership of the Society.
- (b) As to the annual, quarterly or other subscriptions or payments to be payable by the members of the Society.
- (c) As to the rights and privileges to be accorded to, and the qualifications, restrictions and conditions to be imposed on, members of the Society.
- (d) As to Committees of members in connection with various branches of the Society's activities, and as to the appointment, removal, qualification, disqualification, duties, functions, powers and privileges of members of such Committees.
- (e) As to the manner in which the Elections of Officers and Council members shall be conducted.
- (f) As to the Geographical Divisions of the Society for Electoral purposes, and the setting up and regulation of Divisional Councils and their membership, duties, functions and powers.

(ii) The Council shall have power to issue Standing Orders from time to time regulating the appointment of various committees from Members of the Society or otherwise as provided herein for the better administration of the business of the Council and directing the terms of reference of such committees and the procedure governing the transaction of their business.

(iii) Any committee appointed in accordance with this article shall have power to adopt persons to act as members of the committee whose qualifications or experience will assist the committee in its work, but the number of persons so adopted shall not exceed one-third of the membership of the committee excluding adopted members.

## SECRETARY GENERAL

37. (i) The Secretary General shall be appointed by the Council for such time at such remuneration and upon such conditions as they think fit, and any person so appointed may be removed by them. The provisions of Section 177 and 179 of the Act of 1948 shall apply and be observed.

(ii) The Secretary General shall from time to time submit financial statements at the request of the Council. It shall be his duty, under the direction of the Council to conduct the correspondence of the Society, to attend meetings of the Council and Committees thereof, to take minutes of the proceedings of such meetings, to superintend the publication of such papers as the Council may direct, engage and be responsible for all persons employed under him, and, in general, conduct the ordinary business of the Society in accordance with the Memorandum and Articles of Association.

(iii) The Council may from time to time by resolution appoint an assistant or deputy Secretary General, and any person so appointed may act in place of the Secretary General if there be no Secretary General or no Secretary General capable of acting.

## THE SEAL

38. The Council shall provide a Common Seal of the Society and make rules for the safe custody and use thereof, and it shall only be used by the Authority of the Council previously given and in the presence of one member of the Council at least, and every such instrument shall be countersigned by the Secretary General or some other person duly authorised by the Council.

**PROCEEDINGS OF THE COUNCIL**

39. The Council may meet together for the dispatch of business, adjourn and otherwise regulate their meetings as they think fit, and determine the quorum necessary for the transaction of business. Unless otherwise determined, ten shall be a quorum. Questions arising at any meetings shall be decided by a majority of votes. In case of an equality of votes the Chairman shall have a second or casting vote.

40. Five members of the Council may, and on the request of five members of the Council the Secretary General shall, at any time, summon a meeting of the Council by notice served upon the several members of the Council. A member of the Council who is absent from the United Kingdom shall not be entitled to notice of a meeting.

41. The Chairman shall be entitled to preside at all meetings of the Council at which he shall be present, but if no such Chairman be elected, or if at any meeting the Chairman be not present within five minutes after the time appointed for holding the meeting and willing to preside, the members of the Council present shall choose one of the Deputy Chairmen and failing them one other of their number to be Chairman of the Meeting.

42. A meeting of the Council at which a quorum is present shall be competent to exercise all the authorities, powers and discretions by or under the regulations of the Society for the time being vested in the Council generally.

43. The Council may delegate any of their powers to Committees consisting of such member or members of the Council as they think fit, and any Committee so formed shall, in the exercise of the power so delegated, conform to any regulations imposed on it by the Council. The meetings and proceedings of any such Committee shall be governed by the provision of these presents for regulating the meetings and proceedings of the Council so far as applicable and so far as the same shall not be superceded by any Bye-Laws made by the Council.

44. All acts bona fide done by any meeting of the Council or any Committee of the Council, or by any person acting as a member of the Council, shall notwithstanding it be afterwards discovered that there was some defect in the appointment or continuance in office of any such member or person acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed or had duly continued in office and was qualified to be a member of the Council.

45. The Council shall cause proper minutes to be made of all appointments of officers made by the Council and of the proceedings of all meetings of the Society and of the Council and of Committees of the Council, and all business transacted at such meetings, and any such minutes of any meetings, if purporting to be signed by the Chairman of such meeting, or by the Chairman of the next succeeding meeting, shall be sufficient evidence without any further proof of the facts therein stated.

46. A resolution in writing signed by a majority of the members for the time being of the Council or of any Committee of the Council who are entitled to receive notice of a meeting of the Council or of such committee shall be as valid and effectual as if it had been passed at a meeting of the Council or of such committee duly convened and constituted.

**ACCOUNTS**

47. The Council shall cause proper books of account to be kept with respect to:

- (a) all sums of money received and expended by the Society and the matters in respect of which such receipts and expenditure take place;
- (b) all sales and purchases of goods by the Society; and
- (c) the assets and liabilities of the Society.

Proper books shall not be deemed to be kept if there are not kept such books of account as are necessary to give a true and fair view of the state of affairs of the Society and to explain its transactions.

48. The books of account shall be kept at the office, or subject to section 147(3) of the Act of 1948 at such other place or places as the Council shall think fit, and shall always be open to the inspection of the members of the Council.

49. The Council may from time to time impose reasonable restrictions as to the time and manner of the inspection by the members (other than members of the Council) or by Representatives of members of the accounts and books of the Society, or any of them, and subject to such restrictions the accounts and books of the Society shall be open to the inspection of such members or Representatives of members at all reasonable times during business hours.

50. The Council shall from time to time in accordance with Sections 148, 150 and 157 of the Act of 1948 cause to be prepared and laid before the Society in General Meeting, such income and expenditure accounts, balance sheets and group accounts (if any) and reports as are referred to in those Sections. A copy of every balance sheet (including every document required by law to be annexed thereto) which is to be laid before the Society in General Meeting, together with a copy of the Auditors report, shall not less than twenty-one days before the date of the meeting be sent to every member of, and holder of debentures of, the Society. Provided that this Article shall not require a copy of those documents to be sent to any person of whose address the Society is not aware or to more than one of the joint holders of any debentures.

**AUDIT**

51. Once at least in every year the accounts of the Society shall be examined and the correctness of the income and expenditure account and balance sheet ascertained by one or more properly qualified Auditor or Auditors.

52. Auditors shall be appointed and their duties regulated in accordance with sections 159 to 162 of the Act of 1948 the members of the Council being treated as the Directors mentioned in those sections.

**NOTICES**

53. A notice may be served by the Society upon any member, either personally or by sending it through the Post in a prepaid letter, addressed to such member at his registered address as appearing in the register of members.

54. Any member described in the register of members by an address not within the United Kingdom, who shall from time to time give the Society an address within the United Kingdom at which a notice may be served upon him, shall be entitled to have notices served upon him at such address, but, save as aforesaid and as provided by the Act, only those members who are described in the register of members by an address within the United Kingdom shall be entitled to receive notices from the Society.

55. Any notice, if served by post, shall be deemed to have been served on the day following that on which the letter containing the same is put into the post, and in proving such service it shall be sufficient to prove that the letter containing the notice was properly addressed and put into the post office as a prepaid letter.

### DISSOLUTION

56. Clause 9 of the Memorandum of Association of the Society relating to the winding up and dissolution of the Society shall have effect as if the provisions thereof were repeated in these Articles.

### BYE-LAWS

Adopted by Special Resolution dated the 29th March 1974.

### DEFINITIONS

1. The Definitions section of the Articles of Association of the Society shall be deemed to be incorporated in and applied to these presents.

### SUBSCRIPTIONS

2. Annual Subscriptions shall be as hereinafter provided. A first annual subscription shall be made on application for Membership and shall continue in force until the first day of April of the following year, when it shall be renewable.

(a) Individual Members

The annual subscription payable by an Individual Member shall be not less than Three Pounds. On attainment of the age of 65 on payment of a sum of Ten Pounds, Individual Members may, at the discretion of the Council retain their membership of the Society in perpetuity, but always subject to the Council's rights of removal.

(b) Student Members

The annual subscription payable by non-graduate students pursuing their studies at school, college or university shall be One Pound.

(c) Local Authority Members

The annual subscription payable by a Local Authority shall be not less than as follows. For Local Authorities with a population of:

Less than 100,000	£ 50.00
100,001 to 250,000	£ 60.00
250,001 to 500,000	£ 75.00
500,001 to 1,000,000	£100.00

For each additional 500,000 or part thereof £10.00

(d) Corporate Members and Unincorporated Bodies appointed in accordance with Article 4(e) (ii)

The annual subscription payable by Corporate Members and Unincorporated Bodies shall be not less than as follows:

- (i) Small local civic societies, colleges, schools and similar organisations £5.00.
- (ii) Regional and national societies and similar organisations, consultants and small industrial and commercial firms £30.00.
- (iii) Industrial organisations £50.00.

(e) Sustaining Members

The annual subscription for Sustaining Members shall be not less than £100.00.

(f) Membership—Special Cases

The Council shall have power to elect any applicant for Membership to an appropriate grade of Membership, on such special terms as to subscription or otherwise as after considering any reasons for so doing stated by such applicant the Council may think proper.

### REPRESENTATIVES OF MEMBERS

3.(a) Local Authority Members

Each Local Authority Member shall be entitled to appoint not more than four Representatives.

(b) Corporate Members

- (i) Corporate Members paying a subscription of £5.00 per annum shall each be entitled to appoint one Representative.
- (ii) Corporate Members paying a subscription of £30.00 per annum shall each be entitled to appoint two Representatives.
- (iii) Corporate Members paying a subscription of £50.00 or more per annum shall each be entitled to appoint four Representatives.
- (iv) A Corporate Member having a Branch or Section situated in a Division other than that Division in which the address of the Corporate Member is situated shall, in such Division, be entitled to appoint Delegates to participate in the activities of the appropriate Division.

### RIGHTS OF MEMBERS

4. Each Individual Member, Student Member, Local Authority Member and Corporate Member and each Representative of a Local Authority Member or Corporate Member, who has paid the appropriate subscription for the current year, shall have the right to:

- (i) Nominate Individual Members, Student Members and Representatives as officers or Members of the Council;
- (ii) Be nominated and elected as an Officer or Member of the Council;
- (iii) Cast one vote at elections;
- (iv) Receive notices of and attend and participate in all meetings of the Society and of the Member's Division;
- (v) Move or second, and cast one vote on motions at Meetings of the Society and of the Member's Division;
- (vi) Receive free of charge as they are issued the Journal and Year Book of the Society;
- (vii) Obtain from the Society, advice and information on questions relating to pollution and its control.

**DIVISIONS**

5.(a) For administrative and electoral purposes the Society shall be divided into geographical Divisions as follows:

1. **Scotland**
2. **Northern Ireland**
3. **Northern:**  
Cleveland, Cumbria, Durham, Northumberland, Tyne and Wear.
4. **North West:**  
Cheshire, Clwyd, Greater Manchester, Gwynedd, Lancashire, Merseyside.
5. **Yorkshire:**  
Humberside, North Yorkshire, South Yorkshire, West Yorkshire.
6. **West Midlands:**  
Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
7. **East Midlands:**  
Cambridgeshire, Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire.
8. **Eastern**  
Essex, Norfolk, Suffolk.
9. **London and South East:**  
East Sussex, Greater London, Hertfordshire, Kent, Surrey, West Sussex.
10. **Central Southern:**  
Bedfordshire, Berkshire, Buckinghamshire, Hampshire, Isle of Wight, Oxfordshire.
11. **South West:**  
Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset, Wiltshire.
12. **South and Mid Wales:**  
Wales except for Clwyd and Gwynedd.

or such additions or alteration to areas as the Society may determine.

(b) All Members shall be considered as belonging to the Division in which their address, as entered upon the Society's records is situated.

(c) For the purposes of carrying out activities in a Division, the Members, as hereinafter defined, may elect from among themselves a Divisional Council and its Honorary Officers. A Divisional Council and its Honorary Officers, other than Secretary and Auditors, shall consist only of Members, Representatives and Delegates of Members. The Constitution and activities of a Divisional Council shall be subject to the general approval of the Council which shall pay or make grants for approved expenses.

(d) The Members, Representatives and Delegates of Members, as hereinafter defined, in any town or district within a Division, may, if they so desire, and with the approval of the Council and of their Divisional Council, set up a Branch of the Division and elect Committees and Honorary Officers. The activities of a Branch shall be subject to the general approval and guidance of the Council and of the Divisional Council and the Divisional Council may pay and make grants for approved expenses.

**PRESIDENT, VICE-PRESIDENTS, HONORARY MEMBERS AND HONORARY TREASURER**

6.(a) The President and an Honorary Treasurer shall be elected annually on the recommendation of the Council by the Society at its Annual General Meeting.

(b) Vice Presidents shall be elected every three years on the recommendation of the Council by the Society at its Annual General Meeting.

(c) Honorary Members shall be elected on the recommendation of the Council by the Society at its Annual General Meeting.

**THE COUNCIL**

7.(a) The business of the Council shall be specified in Article 35 and shall include the direction of the policy of the Society, the work of its committees, the reception of reports from such committees, from Divisions, from Headquarters and subject groups.

(b) The Council at its first meeting after election shall elect from its own members, a Chairman, two Deputy Chairmen, and the following Committees:

- (i) Conference and Publicity
- (ii) General Purposes and Finance
- (iii) Parliamentary and Local Government
- (iv) Technical
- (v) Any other Committee considered by the Council to be necessary.

(c) There shall also be a Nominations Committee, appointed by the Council. The Terms of Reference of this Committee shall be as set out in the Standing Orders of the Council.

(d) The procedure for the election of Chairman, Deputy Chairmen and Committees, and the rules and functions of all Committees, shall be decided by the Council.

**ELECTIONS**

8.(a) President, Vice-Presidents, Honorary Members and Honorary Treasurer. Nominations for the offices of President, Vice Presidents, Honorary Members and Honorary Treasurer may be made by any Member of the Society. Nominations, in writing, shall be received by the Secretary General not less than three months prior to the date of the Annual General Meeting.

- (b) (i) Divisional Representatives (Elected in accordance with Article 32(a)). Each Member may nominate Divisional Representatives for his own Division provided that he does not nominate more than the total number to be

appointed by that Division. Nominations shall be made to the Divisional Secretary not less than seven days before the date of the Annual General Meeting of the Division. In the event of more nominations being received than there are Divisional Representatives to be appointed, elections by ballot shall be held at the Annual General Meeting of the Division. The result of such an election is to be reported to the Secretary General of the Society not later than seven days before the date of the Society's Annual General Meeting. The names of the persons so elected shall be announced at such Annual General Meeting.

(ii) No Member or Representative of a Member shall nominate, be nominated for, or vote in any Divisional Election other than that of which he is a Member or Representative.

(c) Representatives of National or similar organisations (in accordance with Article 32(b)). Nominations from National or similar organisations shall be received by the Secretary General not less than seven days before the date of the Annual General Meeting.

(d) No nomination for office shall be considered valid unless the agreement of the candidate has been previously obtained.

#### INTERPRETATION OF BYE-LAWS

9. The Council shall have full power to decide any question of interpretation of these Bye-Laws and any other question on which these Bye-Laws are silent, subject to the power of the Society in any subsequent general meeting to review any such decision and to make new provision in relation thereto.



**▶▶PNU-JET▶▶**  
DUST CONTROL EQUIPMENT

# Monitoring the Fallout of Grit and Dust Emitted by Industrial Sources

by

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*A method of monitoring the fallout of grit and dust emitted by industrial sources is proposed which is based upon a computer contour plot of test data collected from sample points arrayed around industrial plant in an orderly geometric manner. From the contour plot a non-directional 'fallout index' can be established which can be used to check the pollution output of the plant being monitored. Such a monitoring system will help industrialists in their efforts to improve standards of production, maintenance and design.*

## Introduction

Most of the so-called heavy industries are major sources of air-borne pollutants. The problems of atmospheric pollution associated with the Iron and Steel Industry have been discussed by Speight (1973), those with the Cement Industry by Ward and Watson (1973), and those with the Electrical Power Industry by Clarke (1973).

Probably of most concern are the emissions of noxious gases and metal laden fumes but grit and dust can also be a problem. At all times consideration must be given to the hazard to health, to the nuisance potential, to the effect on livestock and arable crops and to the danger to wild animals and plant life.

Historically, the introduction of legislation for the control of grit and dust emission has had a minimal effect upon basic manufacturing processes. Compliance with the law has often been achieved by labelling existing plant and machinery as being 'inherently-dusty' and simply adding a suitable dust collector to clear up the offending grit and dust. The legislative process is based on the philosophy of 'best practicable means' (Tunnicliffe, 1973). Manufacturers of dust collecting equipment, probably motivated more by sales competition rather than by legislative pressures, have gradually improved the efficiency of dust arrestment. As a result of this improved efficiency Government Inspectors have been able to gradually stiffen the practicable target levels for dust and grit emission underlining the fact that it is dust arrestment technology which currently dictates the potential rate of decrease in the levels of air pollution. It could be argued (Armstrong, 1973) that the dust collector should not be accepted as the 'only' and therefore the 'best' practicable means for control of grit and dust emission but that manufacturers of production plant and machinery should attempt to modify the production process so as to comply with emission legislation.

No matter how the question of air pollution is tackled it is certain that public pressure will insist on lower levels of fall-out and efficient monitoring systems will be required which will check on the degree of improvement or on any sudden lapses on behalf of industry.

## The Need for Monitoring

A good monitoring system can check on long term trends in pollution rates and also short term changes.

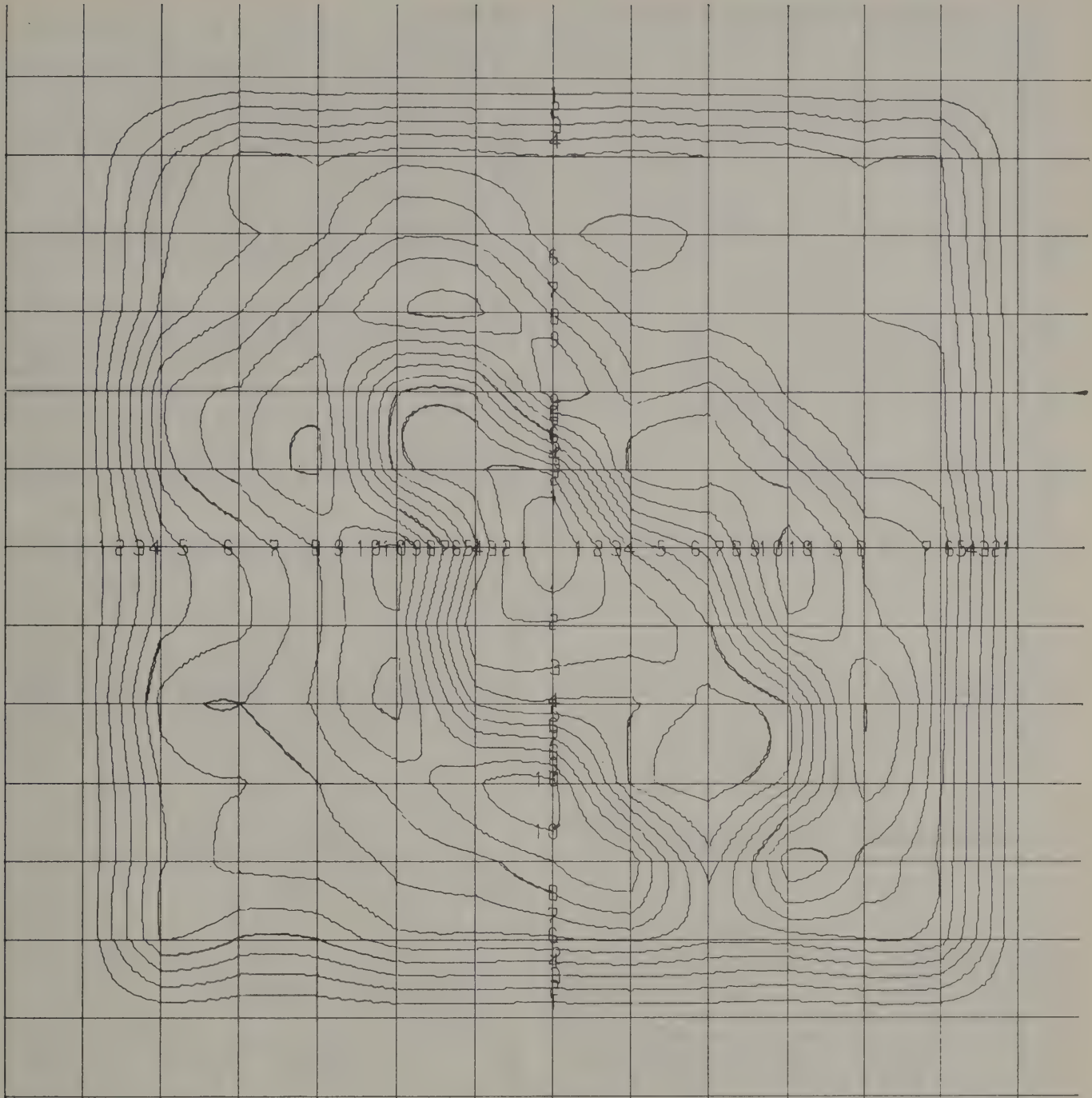
On the adverse side a poor standard of maintenance of dust arrestment equipment can lead to progressive worsening in the level of grit and dust fall-out whilst a sudden breakdown of plant can lead to a rapid increase in pollution rates; such changes should be monitored. At times of great demand for a company's products there is a risk of pushing up production rates to such a level that the extra grit and dust that is bound to be created overtaxes the existing collecting equipment causing an increase in emission rate; such a situation should be readily revealed by any monitoring system which might indicate, for example, that new dust arrestment equipment is needed.

On the credit side the monitoring system should be able to measure the increased overall efficiency of dust arrestment brought about by a major overhaul of existing dust collecting equipment or the introduction of new equipment. If, as suggested earlier, a basic rethink about the production process is undertaken (which implies a moving away from the 'catch it after it's formed' philosophy), modifications of the process specifically introduced to reduce the level of emission should be vetted by the monitoring system to check on the cost-effectiveness of any improvements that may or may not be gained.

## Method of Monitoring

### Collection of data

A wide-scale dust collecting technique such as that developed by Gruber (1970) could be used to provide dust fallout data. The method involves the use of adhesive tape wrapped around suitable cylinders; the tape is chosen for its ability to collect any particle that comes into contact with it and at the same time being little affected by exposure to the elements. These simple sampling devices may be distributed at fixed positions around the dust source and after a suitable period, say two weeks, can be collected for measurement purposes. The measurement can be achieved by employing a 'Gruber Particle Comparator' or, alternatively, a reflectometer which provides comparative reflection values (Armstrong 1973) which would be a function of the



**Table 1**  
A grid of fall-out test data

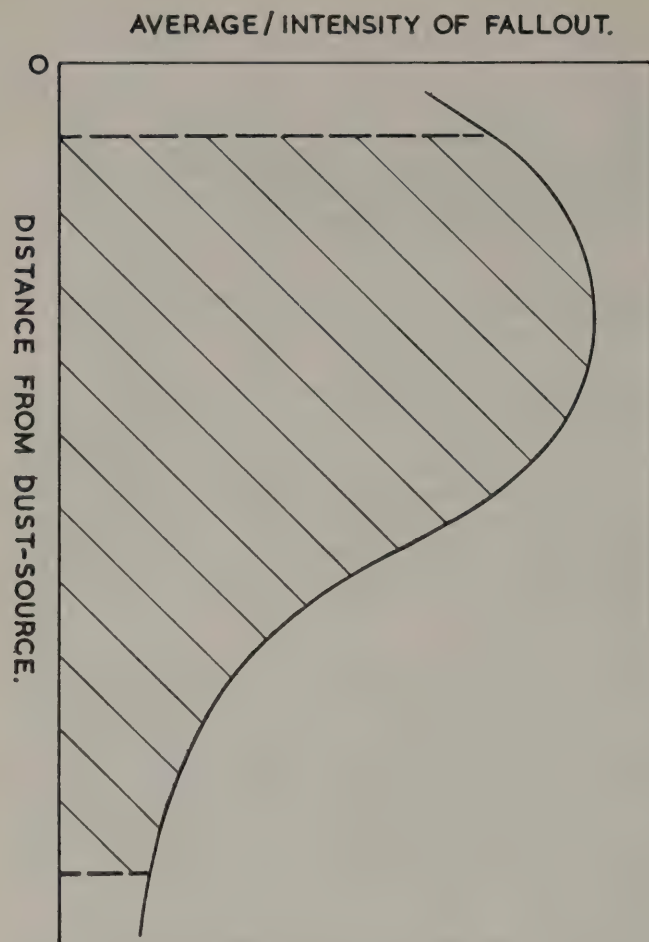
amount of dust on the adhesive tape. The sample points can give a directional indication of dust fall-out; to facilitate this the position of magnetic north is marked on the cylinders before collection. By situating some of the adhesive tape sample points alongside official sample points the collected data can be correlated with the official figures as issued by the Public Health Department.

Parallel to the collection of dust fall-out data, weather conditions should also be noted. When studying the variations in the pattern of fall-out intensity over a period, it should prove advantageous to possess information on quantity of rain fall, number of rainy days, wind direction, wind intensity, humidity, atmospheric

temperature, atmospheric pressure and height of cloud ceiling.

#### Processing of test data

A convenient way of siting the numerous sample points is on the form of a square grid. The orthogonal set of values can be the basis of a contour plot depicting intensity of dust fall-out. In Appendix A details are given of a computer programme which is designed to produce a contour plot from a grid of dust fall-out data. The particular contour plot for the values given in Table 1 is shown in Figure 1. (For convenience of illustration, values outside the grid shown in Table 1 have been set to zero; this has resulted in a rather artificial, square-shaped plateau at the perimeter of the contour



**Figure 2**

The variation of intensity of dust fall-out with distance from source during a test period

plot being drawn. In the contour plot, 1 is equivalent to 5 units of fall-out, 2 is equivalent to 10 units, and so on.)

If concentric circles are drawn on the contour plot with the dust source as centre it is possible to determine the average fall-out intensity at a certain distance from the dust source. A planimeter can be used to measure the area, 'a' within a circular annular, inner radius  $r_1$  and outer radius  $r_2$ , over which an intensity of fall-out,  $h$ , acts. The average intensity,  $I$ , at a mean distance from the dust source of  $(r_1 + r_2)/2$  is given by

$$I = \frac{\sum ha}{\pi(r_2^2 - r_1^2)} \quad (1)$$

The average intensity of fall-out can be plotted against the distance from the source of dust giving a picture such as shown in Figure 2. If the area under the curve between two chosen limits is measured, the hatched region in Figure 2, the resulting value can be regarded as the 'fall-out index' for the period of time for which the data applies. The inner limit could well be the perimeter of the industrial plant whilst the outer limit could be a distance from the works, say 5 Km, where fall-out problems might be relatively slight.

A useful cumulative picture can be built up by plotting the fall-out index against time as shown in Figure 3.

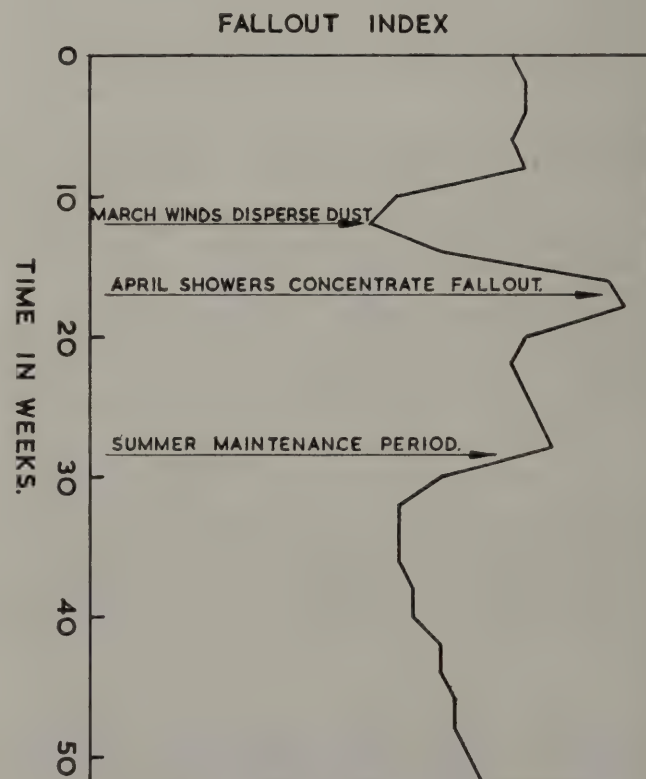
## Discussion

### Non-directional assessment

It should be noted that the values of average intensity of fall-out in Figure 2 are not directional in nature and are not influenced by wind direction. (The values are influenced by wind intensity and other factors.) It follows that the fall-out index is also not directional in nature and is simply a function of the total amount of fall-out within a prescribed distance from the source of dust and grit. As such, the fall-out index can be used to give a quantitative assessment of the potential dust and grit nuisance caused by the industrial plant being monitored.

When test data has been collected and processed for a sufficient length of time it should be possible to distinguish normal seasonal fluctuations in the fall-out index from a steady upward or downward trend due to gradual deterioration or improvement in the standard of management in the fields of production and maintenance and from sudden changes due to plant breakdown or to innovation. (In Figure 3 some fictitious fluctuations have been indicated in order to illustrate the previous remarks.)

It is not intended that the fall-out index should be used to compare one industrial plant with another but only as a quantitative check for the benefit of a works manager on the pollution performance of plant under his care. If the monitoring of a particular works is a private matter the fall-out intensity as indicated by each sample point can be measured to some arbitrary scale decided upon by the works management. (As pollution is a very politically sensitive matter for industrialists the use of some scale with no obvious basic units of measurement might



**Figure 3**

Variation of dust fall-out with time

STATION	A	B	C	D	E	F	G	H	I	J	K
1	25.0	24.0	25.5	31.5	23.0	22.0	32.0	33.7	21.0	19.0	13.0
2	19.4	31.0	29.5	35.0	28.7	31.0	42.0	40.5	29.9	24.0	26.0
3	20.0	32.0	35.0	41.0	39.0	40.5	50.5	47.5	40.8	28.7	24.0
4	28.3	36.0	42.0	51.5	48.2	51.0	18.2	21.0	49.3	39.0	28.0
5	28.7	38.0	49.0	25.0	10.0	21.0	11.0	21.5	51.0	37.0	27.0
6	29.0	45.0	51.0	21.0	11.0	0.0	12.0	49.0	39.0	27.0	25.0
7	31.0	48.0	19.0	21.0	12.0	21.0	47.0	37.0	29.0	23.0	27.0
8	26.0	22.0	13.0	14.0	20.0	32.0	47.0	42.0	27.0	26.0	25.0
9	27.0	48.0	22.0	20.0	48.0	52.0	42.0	29.0	26.0	25.0	24.0
10	29.8	38.0	47.0	50.0	41.0	39.0	29.0	26.0	25.0	23.0	19.0
11	27.0	29.0	30.0	31.0	32.0	33.0	27.0	26.0	24.0	22.0	20.0

TABLE 1  
A grid of fallout test data

encourage more firms to introduce a planned monitoring system of their own.) If an attempt was made to use the fall-out index as a basis for comparison of one works with another, even when the industrial plants were dissimilar e.g. the comparison of a cement works with an integrated steelworks, some standard system for interpreting individual sample point test data would need to be established. The position would be further complicated by the close proximity of other industrial plants to the factory being monitored. A method of attributing the percentage of fall-out to the different works would have to be agreed; this would require a marked degree of industrial co-operation and fair mindedness. The topographical nature of each industrial site would also have to be considered; for example, many modern steelworks are located, or are planned to be located, on the sea coast and any values of fall-out index in such cases, whilst having meaning for the works concerned, would not be the basis for fair comparison unless the absence of test data to seaward was allowed for.

#### Directional assessment

If a directional picture of the fall-out problem is required the above procedure can be repeated for four separate quadrants e.g. north-east, north-west, south-east and south-west. Four curves similar to that in Figure 2 can be drawn eventually leading to four cumulative curves after the fashion of Figure 3. Such an approach can indicate the intensity of fall-out in the neighbourhood of villages and so on and could be a factor in the selection of the time of year to perform such tasks as the introduction of new production plant or the shutting down of dust arresting equipment which might temporarily lead to more dust fall-out and therefore more

nuisance to local townships if the prevailing wind and/or climatic conditions are adverse. Alternatively, if the correct scale is chosen, a quick and direct visual assessment can be made by superimposing the computer contour plot on top of the ordnance survey map for the district around the industrial plant in question.

#### Conclusions

The authors have outlined a method of monitoring the fall-out of dust and grit emitted by an industrial source which enables industrialists to judge whether or not anti-pollution standards of production and maintenance are being maintained.

More positively, the monitoring system can give a quantitative indication of an improvement in fall-out levels resulting from attempts to produce less dust and/or arrest the emission of more dust; it should be possible to assess the cost-effectiveness of any modification in plant or production technique.

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# CLEAN AIR SPRING SEMINAR, 1974

The Third Clean Air Spring Seminar was held at the Hallam Tower Hotel, Sheffield, from the 26th-28th March, 1974. In all there were 135 registrations and the Seminar was also attended by a small number of students from Sheffield University for whom special arrangements were made. The Seminar was opened on the morning of Tuesday, 26th March, by the Master Cutler, Mr. Kenneth Lewis, and that evening all delegates and authors were entertained to dinner in the Cutlers' Hall by the Lord Mayor of Sheffield.

The theme of the Seminar was clean air in Sheffield, a steel city. The scene was set at the first session when Mr. A. W. Maule the Senior Adviser to the Sheffield and District Clean Air Committee presented a paper on "The History of the Campaign Against Air Pollution in Sheffield and District" and showed the film "Clean Air City" made by the City of Sheffield. Mr. J. H. Flux, the Divisional Manager for Environmental Pollution Control, British Steel Corporation then presented a paper on "Atmospheric Pollution Control in the Iron and Steel Industry". The afternoon of the first day was taken up with technical visits to a number of steel works in the Sheffield area where delegates were able to see for themselves some of the actual processes already discussed and which were likely to be discussed at other sessions.

The second session on the Wednesday morning dealt more specifically with some of the problems encountered. Mr. I. C. Ross, the Technical Divisional Manager at the British Steel Corporation, Rotherham Works, presented a paper on "The Development of Fume Cleaning Plant

for the Templeborough Electric Melting Shop" and Mr. A. N. Howard the Environmental Control Engineer of British Acheson Electrodes Limited presented a paper on "Environmental Control in the Manufacture of Artificial Graphite". A further paper was given by Dr. P. B. Simpson, the Regional Industrial Gas Manager of East Midlands Gas on "The Use of Natural Gas in Industry and Its Contribution Towards Cleaner Air". The afternoon was again taken up with technical visits. Visits were made to three British Steel Corporation Works and to British Acheson Electrodes Limited.

On the morning of Thursday, 28th March, Mr. J. G. S. Smith of the National Coal Board, Yorkshire Sales Region, presented a paper on solid fuel and Mr. M. F. Tunnicliffe, HM Deputy Chief Alkali and Clean Air Inspector, gave a paper on "The Contribution of the Alkali Act". This was followed by a very interesting paper given by Mr. T. W. Raven of the Yorkshire River Authority and Yorkshire Water Authority on "River Pollution Prevention and its Relationship with Atmospheric Pollution".

At the final session on the Thursday afternoon Dr. A. B. Hedley of the University of Sheffield presented a paper prepared by himself and Professor J. M. Beer on "The Reduction of Combustion Generated Air Pollution". This was followed by a general discussion of all the various points raised at the Seminar.

This proved to be an extremely interesting Seminar at which there was some very informed and well argued discussion.

## AIR POLLUTION ABSTRACTS

Papers presented to the Third Clean Air Spring Seminar  
of the National Society for Clean Air, Sheffield 26-28 March, 1974

**1316 A History of the Campaign Against Pollution in Sheffield and District.** Maule. This paper describes Sheffield's progress as a steel producing town in the field of air pollution from 1890 to the present day.

Legislation prior to 1956 proved fairly ineffective, but with the Clean Air Act of 1956 a large number of hand fired furnaces using coal changed to oil or gas. Smoke, fumes and unpleasant smells were often discharged from colliery spoil heaps which caught fire from spontaneous combustion. Through careful and controlled tipping and consolidation using bulldozers and inert material, pollution from tips is not as serious as it used to be. Gradually, too, a domestic smoke control programme has been implemented. New residential plans, taking into consideration geographical factors, are further contributions to the cleaning-up campaign in Sheffield. The remaining problems are now red fume from steel melting furnaces using oxygen.

**1317 Atmospheric Pollution in the Iron and Steel Industry.** Flux. This paper reviews the present position with regard to control of atmospheric pollution in the industry as a whole.

The containment of fume from oxygen processes now represents a most serious challenge to the industry. Grit and dust from iron ore processing units can be more easily collected, but because of large-scale operations, high local pollution can still occur. Sulphur dioxide still raises problems in such operations as sintering, but the problems previously associated with black smoke from boilers and other coal-burning plant can now be classed as solved.

Against the background of existing legislation the paper then examines the improvement in plant design and performance which have taken place recently. The iron and steel industry, both in the private and public sector, is conscious of its obligations to the community and is attempting to meet

these in a sensible, effective and practical manner, in spite of the high costs involved. A determined effort is being made to improve performance and also to improve the image of the industry in its relations with the general public, with local authorities and the Alkali Inspectorate. The industry claims that it is taking advantage of all available expertise in its continuing fight against air pollution.

**1318 The Development of Fume Cleaning at the Templeborough Electric Melting Shop.** Ross. This paper reviews the historical development of fume containment and arrestment at Templeborough Electric Melting Shop. Pilot plant trials on an 8-ton arc furnace were started in 1959, leading to the specification of fume cleaning plant for the 6 x 135 ton furnace to be installed at Templeborough between 1962 and 1965. Operation of the fume cleaning plant, coupled with pressive uprating of furnace power and capacity to 180 tons, give rise to operational problems and

an intensive research programme was undertaken to support major engineering changes. The culmination of almost 10 years' experience and endeavour has resulted in efficient operation of the plant to meet the requirements of the Alkali Inspectorate and to satisfy the Local Authorities.

#### **1319 Environmental Control in the Manufacture of Artificial Graphite.**

Howard. This paper examines the way in which environmental control in the manufacture of artificial graphite is being approached by British Acheson Electrodes Ltd. It pays considerable attention to their general and organisational methods to the overall problem of environmental control and most of the technical aspects of their work are discussed in some detail. It examines what progress has been made up to date, remaining problems and possible proposals for their solution.

#### **1320 The Use of Natural Gas in Industry and its Contribution Towards Cleaner Air.**

Simpson. This paper deals with the attributes of natural gas. The products of combustion of natural gas contain negligible amounts of polluting sulphur compounds, do not produce carbon smoke, and whilst high temperature combustion may produce nitrogen oxides, this does not imply any serious utilisation problem, or limitation. A financial benefit to the user is, of course, that chimney heights for large boiler plants are

permitted to be correspondingly lower with sulphur free natural gas combustion than with sulphur containing fuels. Natural gas would appear to be the ideal fuel for improving the environment. Select marketing in particularly heavily polluted areas should greatly contribute to its reduction.

#### **1321 Now Solid Fuel Makes a Clean Sweep.**

Smith. This paper is intended to demonstrate the improvements which have taken and are taking place in the combustion of solid fuel, in order to give greater efficiency in use, which in turn automatically results in a reduced level of emission to the atmosphere for the same amount of useful heat. The measures which have been taken by the Solid Fuel Industries, together with the appliance manufacturers, enabling these fuels to be burnt without serious adverse consequences on the environment, are discussed.

#### **1322 The Contribution of the Alkali Act.**

Tunnicliffe. This paper reports the contribution of the Alkali Act towards preventing air pollution and deals particularly with coke manufacture in Sheffield and District in connection with the iron and steel industry. It analyses the progress made in pollution control during coke manufacture, and looks into the future both as regards emission standards and control equipment to be used.

**1323 Reduction of Combustion Generated Pollution.** Beer and Hedley. This is a very far-ranging paper which examines the main pollutants and the need for control. It then considers the various control methods employed at source and examines the necessity for air quality criteria and emission standards.

The paper concludes that further research is necessary to provide information for the development of new and improved diagnostic techniques used both in the laboratory and in the field for determining pollutant concentration. There is also a need for the better understanding of the mechanism of the formation of pollutants in combustion processes and also in the atmosphere (secondary pollutants). Based on a discussion of control techniques that can be used in three major areas of combustion-generated pollution, namely stationary combustion sources such as power stations and major power plants, aircraft engines and automobile engines, it is argued that the most promising methods of control are those aimed at combustion modification. At the same time it is recognised that not all pollutants will respond equally to such modifications. Therefore there is a need for parallel research and development of processes for the removal of pollutants from the fuel, eg desulphurisation of fuel oil.

Finally, the paper recommends that because of the promise shown by methods of combustion modification for emission control, and also because of the perplexity of the research and development problem, a ten year plan for research and development on air pollution control by combustion modification should be commissioned.

## **PRELIMINARY NOTICE**

The 4th Clean Air Spring Seminar on  
'GRIT, DUST AND FUME—  
ITS MEASUREMENT AND CONTROL',  
will be held from 18th-20th March 1975,  
in Newcastle upon Tyne.

## **Forthcoming Course**

Air Pollution and Meteorology, 24-30 August 1974 at University Hall, Cardiff. This course is sponsored by the Royal Meteorological Society and is aimed at people with professional or amateur interest in air pollution who seek a better understanding of the role of weather in air pollution problems. Experiments will be made in the field and there is a full programme of lectures. The course is organised by members of Professor R. S. Scorer's Air Pollution Research Group; applications to: Mr R. A. Cox, Dept. of Mathematics, Imperial College, London SW7.

# Comparison of Air Pollution Statistics

by Albert Parker, CBE, DSc.

The figures in the following Tables A and B, prepared by Albert Parker, CBE, DSc., were derived from the statistics issued in 1955 by the Ministry of Fuel and Power, from 1956 to 1969 by the Ministry of Power, in 1970 by the Ministry of Technology and from 1971 to 1973 by the Department of Trade and Industry. The publications are available from H.M. Stationery Office. The factors used to obtain the coal equivalents given in Table A were

*1 tonne of petroleum=1.7 tonne of coal.*

*280 therms of natural gas and colliery methane=1 tonne of coal.*

Nuclear and hydro electricity were converted to the amount of coal needed to produce the same amount of electricity at the efficiency of contemporary steam power stations.

**Table A.—Coal Equivalents of the Primary Forms of Energy used in the United Kingdom in 1938, 1956, and Each Year from 1960 to 1972.**

*Quantities in Million Metric Tonnes*

<i>Year</i>	<i>Coal</i>	<i>Oil</i>	<i>Hydro Electricity</i>	<i>Nuclear Electricity</i>	<i>Natural Gas</i>	<i>Total</i>	<i>Per Capita Tonnes</i>
1938	178.5	12.6	0.7	—	—	191.8	4.03
1956	217.4	38.1	1.3	—	—	256.8	5.03
1960	198.6	66.6	1.7	0.9	0.1	267.9	5.09
1961	193.1	72.1	2.1	1.1	0.1	268.5	5.08
1962	194.0	79.9	2.1	1.5	0.1	277.6	5.18
1963	196.9	86.7	1.8	2.5	0.2	288.1	5.37
1964	189.6	94.8	1.9	3.2	0.3	289.8	5.35
1965	187.6	104.4	2.3	6.1	1.2	301.6	5.50
1966	176.7	113.5	2.4	7.9	1.1	301.6	5.49
1967	165.6	121.2	2.7	9.0	1.9	300.4	5.46
1968	167.1	127.9	2.2	10.3	4.5	312.0	5.64
1969	163.7	137.9	2.0	10.7	8.5	322.8	5.81
1970	156.9	147.9	2.6	9.6	16.2	333.2	5.98
1971	140.9	149.7	1.8	9.9	26.2	328.5	5.91
1972	122.8	160.1	2.0	10.7	37.3	332.9	5.96

**Table B.—Quantities of Coal used in the United Kingdom in 1938, 1956 and Each Year from 1960 to 1972 in Grates or Furnaces that may cause Smoke Emission.**

*Million Metric Tonnes*

<i>Year</i>	<i>Domestic excluding Miners'</i>	<i>Miners' Coal</i>	<i>Railways</i>	<i>Power Stations</i>	<i>Industrial* Miscellaneous and Collieries</i>
1938	47.3	4.7	13.6	15.3	61.1
1956	31.1	5.4	12.3	46.3	63.6
1960	29.6	5.1	9.1	53.5	48.3
1961	27.5	4.8	7.8	56.3	46.1
1962	27.9	4.8	6.2	61.4	43.9
1963	27.3	4.7	5.0	67.9	42.5
1964	23.4	4.4	3.9	68.5	40.5
1965	22.8	4.3	2.8	70.4	39.4
1966	21.2	3.9	1.7	69.0	36.6
1967	19.1	3.7	0.8	67.7	34.3
1968	18.4	3.3	0.2	75.6	29.7
1969	17.1	2.9	0.2	77.1	27.8
1970	15.4	2.7	0.1	77.2	25.6
1971	13.1	2.5	0.1	68.9	18.5
1972	10.6	2.2	0.1	66.7	15.9

\*excluding coke ovens, gas supply industry and plants for making solid smokeless fuels.

**Table C.—Estimates of Air Pollution by Smoke and Oxides of Sulphur from the Uses of Coal, Coke and Oil in the United Kingdom in 1938, 1956 and Each Year from 1960 to 1972.***Estimates made by Albert Parker, CBE, DSc.**Million Metric Tonnes*

Year	Smoke		Coal	Oxides of Sulphur		Total
	Domestic	Total		Coke*	Oil	
1938	1.74	2.75	3.89	0.24	0.06	4.19
1956	1.28	2.29	4.52	0.36	0.54	5.42
1960	1.21	1.47	4.37	0.36	1.26	5.99
1961	1.20	1.44	4.30	0.37	1.38	6.05
1962	1.18	1.42	4.32	0.36	1.51	6.19
1963	1.08	1.22	4.51	0.35	1.62	6.48
1964	0.98	1.14	4.34	0.31	1.74	6.39
1965	0.88	1.03	4.31	0.31	1.91	6.53
1966	0.84	0.98	4.03	0.29	2.05	6.37
1967	0.76	0.88	3.70	0.28	2.12	6.10
1968	0.75	0.84	3.72	0.29	2.13	6.14
1969	0.70	0.78	3.69	0.26	2.31	6.26
1970	0.64	0.72	3.40	0.17	2.50	6.07
1971	0.47	0.52	2.84	0.13	2.44	5.41
1972	0.45	0.50	2.34	0.13	2.73	5.20

\*including other solid smokeless fuels

**Observations on Tables A, B, and C****Table A**

The figures in Table A show that the coal equivalent of the primary sources of energy used in the United Kingdom increased by about 74 per cent from 191.8 m. tonnes in 1938 to 332.9 m. tonnes in 1972. Over that period the population rose by nearly 18 per cent from 47.5 m. to 55.9 m. so that the coal equivalent per capita increased by 48 per cent from 4.03 to 5.96 tonnes. The proportion of the coal equivalent provided by coal decreased from 93 per cent in 1938 to 37 per cent in 1972, while the percentage provided by oil rose from 6.6 in 1938 to 48 in 1972. Throughout the period 1938 to 1972 hydro electricity provided less than 1 per cent of the total coal equivalent; nuclear electricity was less than 1 per cent from 1960 to 1963 and then increased to about 3 per cent over the years 1967 to 1972. Natural gas provided less than 1 per cent from 1960 to 1967 and then rose each year to reach 11 per cent in 1972. As a result, of the coal equivalent of the total consumption of primary forms of energy in 1972, the percentages were oil 48, coal 37, natural gas 11, nuclear electricity 3 and hydro electricity less than 1.

**Table B**

The burning of bituminous coal in domestic open grates leads to the emission of much more smoke per tonne of coal than any of the other uses of coal given in Table B. The domestic use of coal, excluding miners' coal, fell from 47.3 m. tonnes in 1938 to 10.6 m. tonnes in 1972. The main reasons for this great decrease are firstly that during the 1939-45 war coal and coke for domestic use were rationed. In consequence, householders began to use more electricity and gas for heating and decided that they were more convenient and cleaner than heating by coal. Secondly, in 1956 there was the Clean Air Act enabling local authorities to establish smoke control areas in which the burning of bituminous coal in open domestic grates would be prohibited. It was a few years before an appreciable number of smoke control areas had been established; progress in this direction has continued but not so rapidly as desirable. Thirdly, since 1945 there has been an increase in the number of housewives taking employment; this has led to an increasing demand for convenient gas and electric methods of heating. It is difficult to estimate the relative effects of the three factors. The reduction in the amount of concessionary coal to miners from 5.4 m. tonnes in 1956 to 2.2 m. tonnes in 1972 was due to a substantial reduction in the number of wage earners engaged in the deep mining of coal.

From 1956 to 1970 steam-driven railway locomotives, which emitted smoke, were steadily replaced by diesel engines and electric traction so that the consumption of coal by the railways fell from 12.3 m. tonnes in 1956 to 0.1 m. tonne in 1970. The coal consumption by power stations increased from 15.3 m. tonnes in 1938 to 46.3 m. tonnes in 1956 and 70.4 m. tonnes in 1965 with later fluctuations and a maximum of 77.2 m. tonnes in 1970. Power stations also consumed considerable quantities of oil. Industrial undertakings and collieries reduced their consumption of coal from 63.6 m. tonnes in 1956 to 15.9 m. tonnes in 1972 by replacing coal by oil, electricity from the public supply and to some extent during 1970 to 1972 by natural gas.

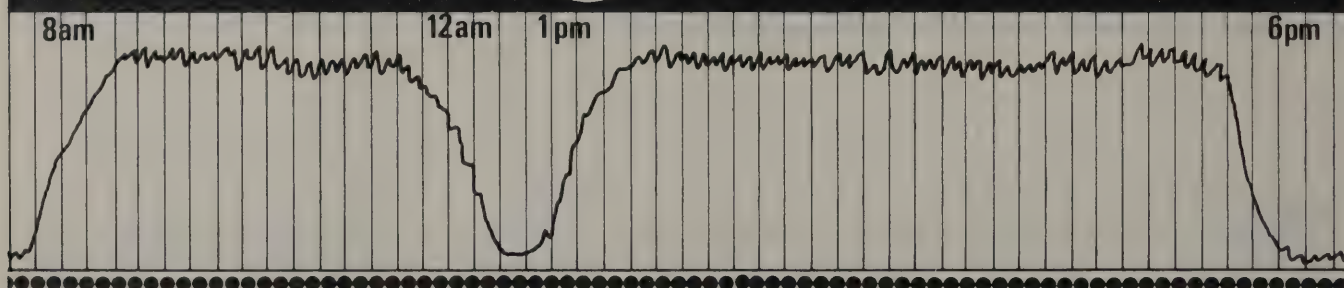
**Table C**

The observations on the figures in Tables A and B give the reasons for the great reduction in the emission of smoke from domestic open fires. The percentage reduction in smoke emission from the uses of coal by industry for raising steam and heating furnaces was greater than the percentage reduction in the amount of coal used. This was partly due to the Clean Air Act which indirectly also stimulated efforts to improve the efficiency of use of coal by industry. The emission of smoke from the use of coal by industry and the railways has been reduced over the years 1956 to 1972 by 95 per cent from 1.01 to 0.05 m. tonnes. Over the same period the emission of smoke from domestic fires has been reduced by 65 per cent from 1.28 to 0.45 m. tonnes. In 1956, of the 2.29 m. tonnes of smoke 56 per cent was from domestic fires and 44 per cent from the uses of coal by industry and the railways. In 1972, of the 0.50 m. tonnes of smoke emitted 90 per cent was from domestic fires. It is clear that further effort should be made to reduce smoke emission from domestic chimneys.

The estimated emission of oxides of sulphur from the uses of coal, coke and oil rose from 5.4 m. tonnes in 1956 to 6.5 m. tonnes in 1965 and then declined gradually to 5.2 m. tonnes in 1972. Over the years 1956 to 1969 the amount of oxides of sulphur each year was approximately in proportion to the coal equivalent of the coal and oil consumed. In 1971 and 1972 there was some reduction in the average percentage of sulphur in the coal and oil used.

*A. Parker*

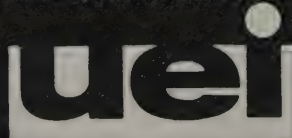
# For continuous monitoring of toxicity...



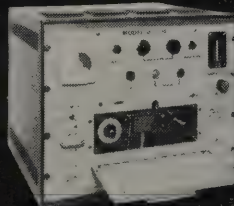
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# CHLORIDE LAUNCHES BRITAIN'S FIRST COMMERCIAL BATTERY BUS



Britain's first full-size battery-powered bus is to go into commercial service in Manchester in the next few months. Built by Chloride, Britain's largest manufacturer of rechargeable batteries, in co-operation with the South East Lancs and North East Cheshire Transport Authority (SelneC), the single decker bus has a range of up to 40 miles on one charge and a top speed of 40 m.p.h.

Named Silent Rider, the Chloride/SelneC bus carries 50 passengers, has a very low noise level and is pollution free. Its power pack consists of a 330 volt Chloride motive power lead acid battery comprising 165 cells, fitted with an automatic topping up device. It is equipped with the latest electronic controls and has an acceleration from rest of 3.3ft/s/s. Regenerative braking is also used to slow down and halt the bus—thereby minimising the wear and maintenance of brake linings. The electricity thus generated is fed back into the batteries.

A Chloride Company, Chloride Legg, which specialises in lead acid battery charging, has developed a revolutionary charger for the bus. Known as the PRV charger (Programmed Rate of Rise of Voltage) it will fully recharge Silent Rider's batteries in as little as 3½ hours (conventional charging normally takes 8 hours). It can also be used for boost charging, replacing 1 per cent of Silent Rider's battery capacity every minute up to 75 per cent of capacity. Development of the battery bus is the result of a two year project by Chloride, with its partner SelneC, with Sevcon who developed the electronic controller, with Seddon who built the body and with EDC who built the special motors. It follows the highly successful development since the war of battery power for fork lift truck and milk float. There are more than 120,000 of these battery powered units in use in Britain today.

These restricted area vehicles perform well in their own specialised environment and many other countries  
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are now following the British pattern. The advances in electronic control systems which enable much higher speeds and battery utilisation to be achieved, however, caused Chloride to look for further applications for battery motive power. The urban bus was the obvious choice as it has a predictable route pattern which is ideal for a battery-powered vehicle.

In fact surveys conducted by SelneC have shown that:

1. The average speed of buses engaged on city centre services between 0630-1000 and 1530-1830 is 8.5 m.p.h.
2. Up to 45 per cent of the vehicle fleet is utilized for less than 7 hours in every 24.
3. 50 per cent of city centre journeys during peak periods cover less than 25 miles, with a further 40 per cent covering no more than 40 miles.

Silent Rider has an operating range of 40 miles and a top speed of 40 m.p.h. which gives some idea of the potential that exists in Britain for battery powered buses.

Although it will have a higher capital cost, the running costs of Silent Rider match those for a diesel vehicle. The Mark II design now being developed by Chloride will have interchangeable battery packs, which will bring the running costs very much in favour of the battery bus when both diesel and battery versions are operated on comparative terms.

In addition to the contribution Silent Rider will make to reducing atmospheric pollution and noise it will also lead to a substantial reduction in maintenance and downtime. It is also thought that the very smooth acceleration of the bus and the reduced noise levels will lead to greater customer acceptance of public travel.

Chloride have always believed that the existence of a practical vehicle was necessary to stimulate the setting up of serious studies in the utilisation of a limited range vehicle in the patterns of the public transport sector. Silent Rider provides the base for studies not only on buses but for many other types of programmed delivery vehicles such as those used for post and freight.

Work has already commenced on the Mark II version of Silent Rider. Geoffrey Cooper, Managing Director of Chloride Technical, which is conducting the motive power programme has said that "it is intended to aim for a fleet of perhaps 20 vehicles operating from one base and discussions are currently being held by Chloride and SelneC with the Department of Trade and Industry and the Department of Environment, to explore ways of funding the very considerable costs involved in this second stage development. We would, of course, be happy to include other passenger transport authorities in this programme."

# National Society for Clean Air

136 North Street, Brighton BN1 1RG (Brighton 26313)

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D. J. Barnett, Environmental Health Dept., Union House, Union Street, Bristol BS1 (0272 26241).

### **SOUTH WALES and MONMOUTHSHIRE**

L. Morgan, 9 Lodge Drive, Baglan, Port Talbot (5231)

The parent of the Society was the Coal Smoke Abatement Society, established in London in 1899. It did valuable pioneering work and accomplished the first necessary stage of making it understood that clean air was not the pet notion of a few cranks. It co-operated with a provincial association that had been formed in 1909—the Smoke Abatement League of Great Britain. These two bodies amalgamated in 1929 to form the National Smoke Abatement Society. This name was retained until 1958, when it was changed to the present one.

From a handful of individuals the Society's membership has grown to include not only considerable private membership both at home and abroad, but membership of local authorities, corporate bodies, (representing the Learned Societies and Institutions),

the fuel industries and those industries concerned with the production of appliances and equipment connected with clean air.

The Society is a voluntary body and receives no official grant, and therefore essentially subsists on the subscriptions of its members. The general policy of the Society is Directed by the Executive Council and its Committees. There are twelve Divisional Councils of members, with their own committees and honorary officers.

The Society's objects are, in brief, to promote and create by publicity and education an informed public opinion on the value and importance of clean air and to initiate, promote and encourage the investigation and research into all forms of atmospheric pollution in order to achieve its reduction or prevention.

# SO2

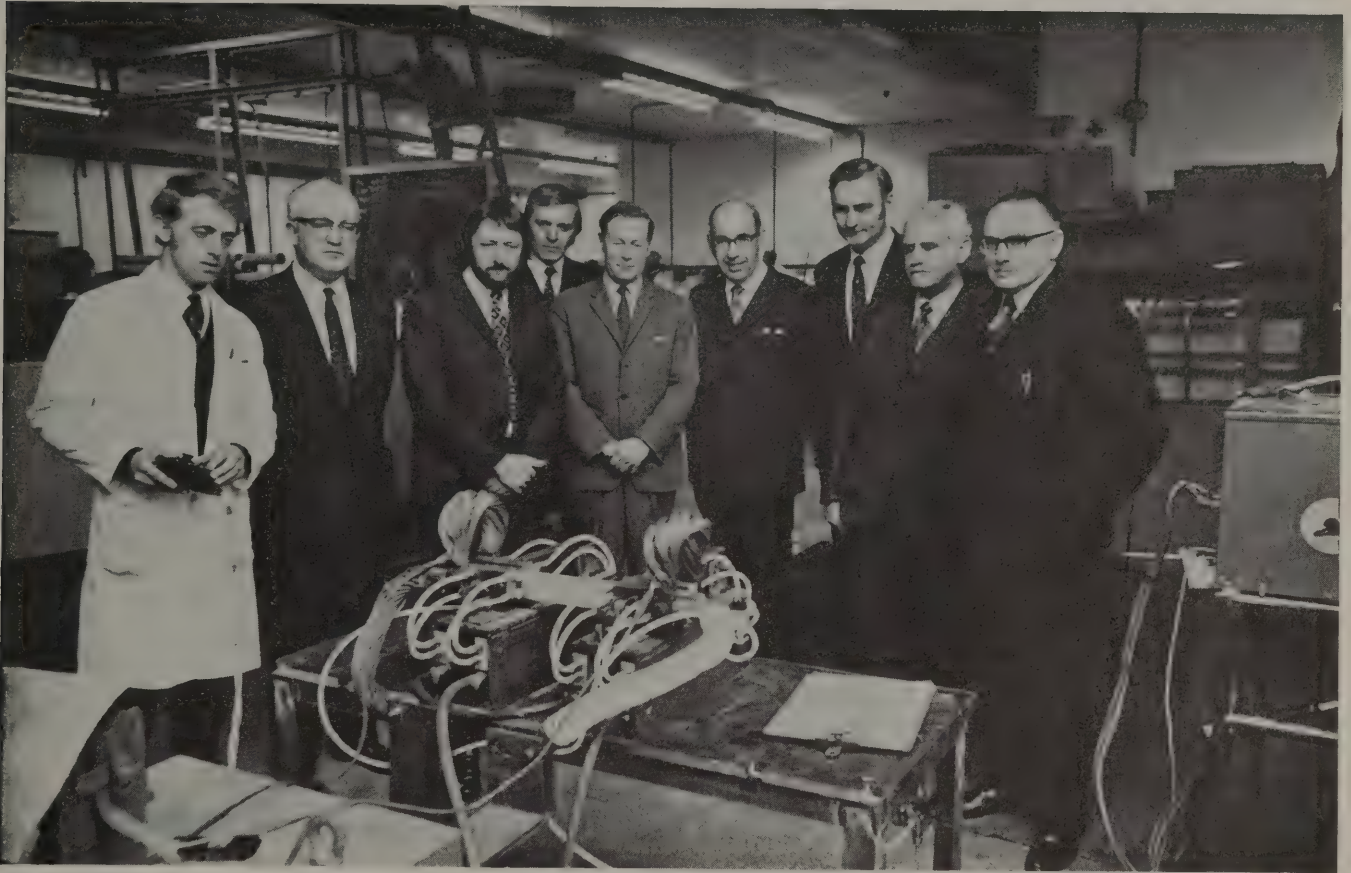
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this report by the Technical Committee of the  
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National Society For Clean Air

# NEWS FROM THE DIVISIONS

## WEST MIDLANDS



West Midlands Division at Midlands Electricity Board Headquarters. Some Members of the Divisional Council at the Industrial Development Centre watching the heating of metal by direct electrical resistance.

*From left to right: M. E. B. Engineer, Cllr. H. N. Scrimshaw (Chairman), Mr. F. Rogers, Mr. G. Simister, Mr. H. B. Dunstan, Mr. S. Cayton, Mr. A. Wood (Midlands Electricity Board), Mr. G. E. Earnshaw, Cllr. J. Holston.*

## EAST MIDLANDS

The Chairman, Alderman A. Lister Robinson, welcomed members to a meeting at Chesterfield on 7th March and also welcomed the two speakers Mr. F. P. Williams of the Warren Spring Laboratory of the Department of Trade and Industry and Rear Admiral P. G. Sharp, C.B., D.S.C., Director of the Society.

After apologies were received and minutes of the previous meeting read, Mr. Williams was introduced. He spoke on the National Survey of Air Pollution 1961-1971 with particular reference to the East Midlands.

Mr. Williams said there had been a sharp decrease in smoke concentrations over the years and they were now less than half what they were in 1958. 85% of the smoke now comes from domestic sources. Lowest values in the country were from the south, the south-west and the south-east, together with Wales where the local coals are almost smokeless. Latest figures for 1972 show that the East Midlands have dropped from 60 micrograms/cu. metre to 51 micrograms/cu. metre in that year. The figure can be compared with domestic coal consumption which is highest in Wales, but the smoke concentrations are low because of the natural smokeless fuels. East Midlands is in the central range both for coal consumption and for pollution.

Turning to trends in sulphur dioxide, Mr. Williams said overall emissions had increased by 10% largely due to power stations, but since these all emit at a very high level the effects at ground level were not very great. Domestic emissions were down by half and industrial by 10%, indicating that the reduction was mainly a consequence of the reduction in domestic emissions. The regional distribution was similar to that for smoke, except for London where the concentrations over the central area were the highest of any in the United Kingdom. This is due to a combination of high population density, commercial premises and a larger amount of industry than is often realised. In 1972 reductions in the East Midlands were from 96 micrograms/cu. metre to 87 micrograms/cu. metre taking average figures.

The major population of the East Midlands was in a 30 kilometre belt from Leicester through Nottingham, Derby and Chesterfield up to Worksop where the population is around 800 people per square kilometre, which is double that for the rest of the region. Miners concessionary coal accounts for 40% of the consumption and is mainly in the north-west part of the region. The highest concentrations are those found in what is called the Nottingham/Derby sub-region which contains all the sites showing above average readings with the exception of one in Lincolnshire. All sites in smoke control areas are below average and the highest figures are found in Alfreton and Mansfield Woodhouse where readings are more than twice the average for the region.

Sulphur dioxide shows much the same pattern as for smoke, most of the above average concentrations being in the north-west of the region. The highest concentrations are still near the commercial sections of the towns and are 50% above average. Doctor Lawther of the Medical Research Unit of the Medical Research Council had laid down levels at which susceptible people might be affected by smoke and sulphur dioxide concentrations and there had only been a small number of instances where these figures had been exceeded and in 1972/73 this had happened on one day only. The World Health Organisation have set lower figures. Outside the Notts. and Derby region in the last 10 years the reduction in smoke has been of the order of 65% and more in smoke control areas. Sulphur dioxide is 50% down and this is helped by the social trend to convenience fuels such as gas, electricity and oil.

Following this introduction of the National Survey, Mr. Williams answered questions from a number of people present.

The Chairman then introduced Rear Admiral Sharp, Director of the Society, who spoke about the history of the Society and the recent changes in its structure. Rear Admiral Sharp's speech has not been published here as this subject was fully-covered in his editorial at the beginning of this issue.

A vote of thanks to the speakers was moved by the Secretary, Mr. E. F. Raven, who also thanked the Mayor and the Corporation of Chesterfield for making available their Council Chamber and providing hospitality. Special mention was made of the work put in by Mr. J. H. Brackenbury in making all the arrangements.

Mr. Raven said he had taken it upon himself to wind up the meeting because he felt that he was perhaps in a position to speak more easily than a good many people present, since he was involved in no amalgamation of authorities and would be doing much the same job after 1st April, 1974, as before. There were present members of the various Councils which had supported the Society

so loyally in the past and who were retiring from participation in local affairs. There were also Chief Public Health Inspectors who were retiring and others whose authorities were ceasing to exist. To all of those people, the Society owed its thanks for their support. It was to be hoped that those who were there for the last time would think confidently and not despondently; would think like Paul when he said "I have fought a good fight; I have finished my course; I have kept the faith."

There was thus a sense of history, but there was also a sense of continuity and a sense of future. It gave great satisfaction to have present Mr. Wade who formed the Division 25 years ago on 7th April, 1949, and Mr. Drabble who followed Mr. Wade as Secretary. There were, too, the Individual and Corporate Members who sustained that sense of continuity—in particular Mr. Turner, who, though well into his seventies, still kept Mr. Raven on his toes so far as clean air in Derby was concerned.

But inevitably the meeting had to turn to the future—to the members of the new County and District Councils and to the new Chief Environmental Health Officers who were in a very real way the custodians of the Environmental Services and the moulders of the image which the new and largely independent Environmental Health Service would present.

The Society looked to them for support in its new and widened role.

In conclusion Mr. Raven said he would like to add his personal thanks to all the retiring people for their support during his time as Secretary.



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## NORTHERN IRELAND

The Spring Meeting of the Northern Ireland Division of the Society was held on Tuesday, 2nd April, 1974, in the Slieve Donard Hotel, Newcastle, Co. Down. The delegates to the meeting, who were drawn from local government, Ministry departments, industry and commerce, were welcomed to Newcastle by Mr. Edward McVeigh, Chairman of Down District Council.

The conference was then formally opened by Mr. Roy Bradford, Minister for the Environment (Northern Ireland). Mr Bradford stressed the importance of air pollution control and the usefulness of the Society in spreading publicity for the clean air cause. The Minister took the opportunity of widening the scope of his speech to include the broader view of the environment. He announced the extension of a scheme designed to encourage local authorities to accept grant aid for special schemes for local improvements. This cosmetic work can do much to remove eyesores and improve the environment.

The Minister especially stressed the fact that the new District Councils have a large part to play in pollution control, with particular reference to monitoring of air pollution levels and assessing local problems. The first paper of the meeting was presented by Dr. A. W. C. Keddie, Senior Scientific Officer with the Department of Trade and Industry at Warren Springs Laboratory, Stevenage. Dr. Keddie who is responsible for the interpretation of data gathered for the National Survey explained the scope of the survey and the extent to which Northern Ireland has been covered.

With the aid of numerous graphs and charts Dr. Keddie examined trends of smoke and sulphur dioxide levels within the Province and then put these figures into the National context. It appears that Northern Ireland comes halfway in the "League table" of pollution levels. In the city of Belfast during the ten years of the survey there has been a 50 per cent reduction in smoke levels but a lesser reduction—some 15 per cent in sulphur dioxide levels.

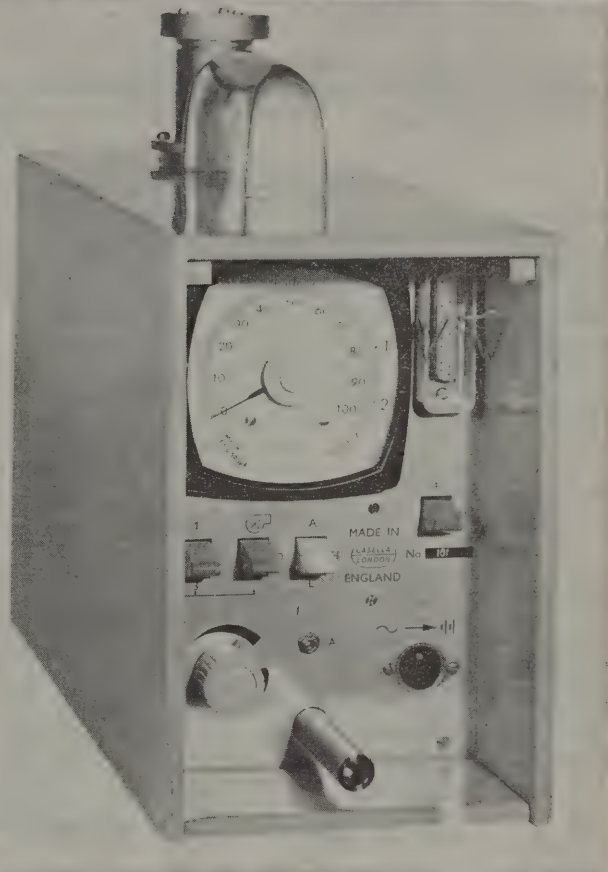
Mr. K. H. Lynas, Chief Environmental Health Office, Department of the Environment for Northern Ireland, and a member of the Divisional Council, presented a paper entitled "Some aspects of Pollution—a look back and forward". The speaker outlined several aspects of pollution control emphasising the need for further action in control and monitoring of pollution and discussed the future trends and possible problems. Mr. Lynas then introduced the film "Clean Air City", kindly loaned by the City of Sheffield Publicity Department. This story of clean air progress was well received by those present.

The final session of the meeting was taken up by a forum which discussed the "Energy Crunch". Mr. D. G. Barrett, General Manager, Coal Advisory Service, Mr. J. A. S. Gardner, Shell Marketing Ltd., Mr. J. M. Brown, Belfast Gas Manager, and Mr. R. McCrory, Northern Ireland Electricity Service, each made a brief statement and answered questions from the delegates.

After an interesting discussion the Chairman of the Division and of the Spring Meeting, Mr. R. Campbell Brown invited the Deputy Chairman, Mr. W. J. Davison, Director of Environmental Health Services, Belfast to thank the speakers. At Mr. Davison's invitation the conference then passed a vote of thanks to the speakers and to the Honorary Secretary for the arrangements for the meeting which seemed to be very satisfactory.

The delegates were then entertained to a reception kindly provided by the Coal Advisory Service which rounded off proceedings in fine style.

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# SMOKE CONTROL AREAS

## Progress Report

### Position at 31st March 1974

(Figures supplied by the Department of the Environment, The Welsh Office, The Northern Ireland Ministry of Development and the Scottish Development Department).

	England			Wales			Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 31.12.73</b>	4,265			19			224			58		
Acres .. .. .		1,305,695			2,855			117,551*			14,107	
Premises .. .. .			6,002,969			10,499			520,150			34,456
<b>Smoke Control Orders Confirmed (31.12.73-31.3.74)</b>	74			—			4			—		
Acres .. .. .		48,650			—			3,879			—	
Premises .. .. .			124,326			—			4,166			—
<b>Totals .. .. .</b>	<b>4,339</b>	<b>1,354,345</b>	<b>6,127,295</b>	<b>19</b>	<b>2,855</b>	<b>10,499</b>	<b>228</b>	<b>121,430</b>	<b>524,316</b>	<b>58</b>	<b>14,107</b>	<b>34,456</b>
<b>Smoke Control Orders Submitted (31.12.73-31.3.74)</b>	86			1			—			—		
Acres .. .. .		38,954			249			—			—	
Premises .. .. .			132,788			1,613			—			—
<b>Grand Totals .. .. .</b>	<b>4,425</b>	<b>1,393,299</b>	<b>6,260,083</b>	<b>20</b>	<b>3,104</b>	<b>12,112</b>	<b>228</b>	<b>121,430</b>	<b>524,316</b>	<b>58</b>	<b>14,107</b>	<b>34,456</b>
<b>Smokeless Zones (Local Acts) in Operation</b>	44			—			—			—		
Acres .. .. .		3,400			—			—			—	
Premises .. .. .			41,060			—			—			—

\* Figure corrected since last quarter.

## SMOKE CONTROL POSITION IN REGIONS OF ENGLAND

### at 31st March 1974

(Figures supplied by the Department of the Environment)

(1) Region	(2) No. of black area acres covered by smoke control and smokeless zones orders confirmed or awaiting decision	(3) Percentage* of total black area acreage in region covered	(4) No. of black area premises covered by smoke control and smokeless zones orders confirmed or awaiting decision	(5) Percentage* of total black area premises in the region
Northern .. .. .	71,389	57	291,360	53
Yorks & Humberside .. .. .	270,956	72	855,485	73
East Midlands .. .. .	91,057	34	278,234	54
Greater London .. .. .	313,594	96	2,513,359	95
North West .. .. .	255,805	62	1,070,437	63
West Midlands .. .. .	108,642	44	500,379	48
South West .. .. .	12,710	48	57,539	39
Total (black areas) .. .. .	1,124,153	63	5,566,793	72
Outside black areas .. .. .	269,146		693,290	
<b>Grand Totals .. .. .</b>	<b>1,393,299</b>		<b>6,260,083</b>	

\* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke-control orders (eg: there may be some areas of open country).

# New Smoke Control Orders

*The lists below are supplementary to the information in the last issue of Clean Air (Spring 1974) which gave the position up to 31 December 1973. They now show changes and additions up to 31 March 1974.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.*

## ENGLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

#### Outside the Black Areas

Flaxton R.D. (Huntingdon No. 1).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

#### Northern

Darlington C.B. (No. 10), Gosforth U.D. (No. 7), Hartlepool C.B. (No. 26), Jarrow B.C. (No. 14), South Shields C.B. (No. 19), Teesside C.B. (Nos. 11, 18 and 19), Wallsend B.C. (Nos. 8, 9 and 10).

#### North West

Ashton-in-Makerfield U.D. (No. 1, 1972), Bebington B.C. (No. 26 [27]), Blackburn C.B. (No. 15), Bolton C.B. (West Ward No. 6), Horwich U.D. (No. 6), Manchester C.B. (Princess Road), Oswaldtwistle U.D. (No. 6), Runcorn U.D. (Nos. 10 and 11), St. Helens C.B. (No. 9), Stockport C.B. (Heaton Mersey/Heaton Moor), Wallasey C.B. (No. 18), Westthroughton U.D. (No. 9).

#### Yorkshire and Humberside

Barnsley C.B. (Nos. 21 and 22), Halifax C.B. (No. 20B), Keighley B.C. (No. 9), Leeds C.B. (Nos. 116, 117 and 118), Wakefield C.B. (Eastmoor No. 2 and Primrose Hill No. 1), Wath upon Dearne U.D. (Nos. 8 and 9).

#### East Midlands

Leicester C.B. (Nos. 34 and 35).

#### West Midlands

Dudley C.B. (No. 61), Stourbridge B.C. (No. 34), Walsall C.B. (No. 19), West Bromwich C.B. (Nos. 26 and 27).

#### South Eastern

Dartford B.C. (No. 13).

#### Greater London

Barnet L.B. (No. 16), Harrow L.B. (No. 29), Kingston upon Thames (No. 23), Newham L.B. (Nos. 11 and 12), Sutton L.B. (Nos. 29 and 30).

#### Outside the Black Areas

Basildon U.D. (No. 10), Blackburn R.D. (No. 4), Bletchley U.D. (No. 3), Gillingham B.C. (No. 6), Glossop B.C. (No. 7), Harrogate B.C. (No. 5), Heanor U.D. (No. 4), Hemsworth U.D. (No. 2), Lincoln C.B. (Nos. 8 and 9), Luton C.B. (No. 12), Marple U.D. (No. 7), Oadby U.D. (No. 1), Oxford C.B. (Nos. 13 and 14), Rawtenstall B.C. (No. 8), Skipton U.D. (No. 10), Southampton C.B. (No. 14), Stevenage U.D. (Nos. 2 and 5), Thurrock U.D. (No. 10), Wellington U.D. (Salop No. 3).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

#### Northern

Blaydon U.D. (No. 8), Boldon U.D. (No. 21), South Shields C.B. (No. 20), Sunderland C.B. (No. 13), Teesside C.B. (No. 20), Tynemouth C.B. (Nos. 18, 19 and 20), Whickham U.D. (Nos. 16, 17, 18 and 19).

#### North West

Atherton U.D. (Nos. 8 and 9), Briersfield U.D. (No. 8), Bury C.B. (No. 10), Darwen B.C. (No. 14), Horwich U.D. (No. 7), Kearsley U.D. (No. 7), Lees U.D. (Nos. 2, 3 and 4), Manchester C.B. (Princess Road), Oswaldtwistle U.D. (No. 6), Preston C.B. (Nos. 29 and 30), Wallasey C.B. (No. 18), Widnes B.C. (No. 14).

#### Yorkshire and Humberside

Barnsley C.B. (Nos. 21 and 22), Dearne U.D. (Nos. 11 and 12), Halifax C.B. (No. 20B), Hoyland Nether U.D. (No. 4), Leeds C.B. (Nos. 118, 119 and 120), Rawmarsh U.D. (Nos. 1 and 2, 1974), Stanley U.D. (No. 7), Wakefield C.B. (Belle Vue No. 1), Wath upon Dearne U.D. (No. 9).

#### East Midlands

Derby C.B. (No. 29), Mansfield B.C. (No. 8D), West Bridgeford U.D. (No. 4).

#### West Midlands

Stourbridge B.C. (No. 34), West Bromwich C.B. (No. 27).

#### Greater London

Barnet L.B. (No. 16), Bexley L.B. (No. 14), Havering L.B. (No. 8), Hillingdon L.B. (Nos. 25 and 26), Newham L.B. (Nos. 11 and 12), Sutton L.B. (No. 30), Waltham Forest L.B. (Nos. 21 and 22).

#### Outside the Black Areas

Bentley-with-Arksey U.D. (Nos. 6 and 7), Doncaster R.D. (No. 3), Easthampstead R.D. (Bracknell Nos. 4 and 5), Exeter C.B. (Pennsylvania No. 2), Glossop B.C. (No. 7), Gravesend B.C. (No. 3), Guildford B.C. (No. 2), King's Lynn B.C. (Marlborough Park, Marsh Lane, Springwood), Lincoln C.B. (No. 9), Market Drayton R.D. (No. 3), Marple U.D. (No. 7), Reading C.B. (Nos. 20 and 21), Rugby B.C. (No. 16), Saltburn and Marske-by-the-Sea U.D. (Nos. 1A, 6 and 7), Skipton U.D. (No. 10), Slough B.C. (No. 16), Southampton C.B. (No. 15), Tamworth B.C. (No. 7), Whiston R.D. (Knowsley No. 3), Whitby Bay B.C. (No. 11), Workington B.C. (No. 3).

## NORTHERN IRELAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

Belfast C.B.C. (No. 8 [Var.]).

## WALES

### NEW SMOKE CONTROL ORDERS IN OPERATION

Newport C.B.

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Wrexham C.B.

## SCOTLAND

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Dunfermline (William Street / Grieve Street/Chalmers Street), Edinburgh Colinton (No. 4), Paisley (No. 17 [Central]), Hawick (West End).

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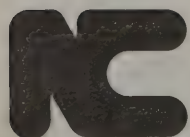
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Chlorine  
Sulphur Dioxide  
Hydrogen Sulphide  
Prussic Acid  
Sulphuric Acid  
Hydrofluorosilicic Acid  
Molybdenum Sulphide  
Lead Chloride fumes from de-leading furnace  
Zinc Oxide furnace fumes  
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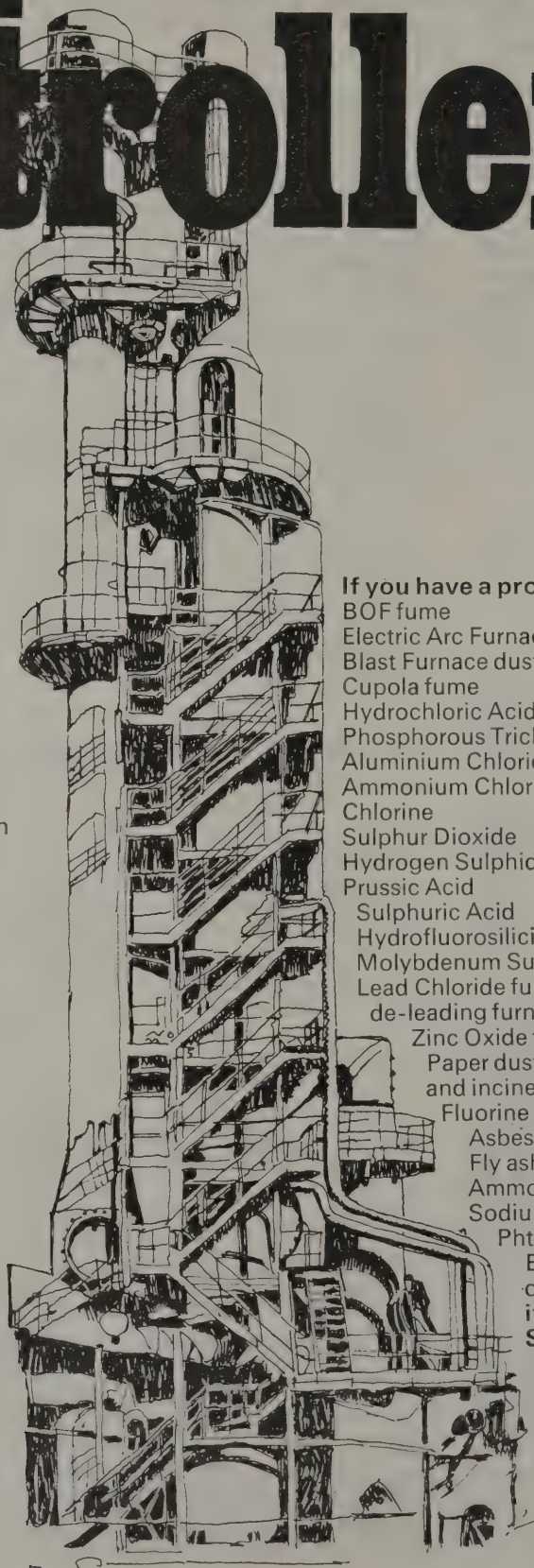
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# BOOK REVIEWS

**Environmental Engineering, A Chemical Engineering Discipline**, edited by G. Lindner and K. Nyberg. Pp. 449 + xii. D. Reidel Publishing Company, Dordrecht-Holland/Boston-USA.

Mr. Lindner is with the Research Institute of Swedish National Defense, Sundbyberg, Sweden, and Mr. Nyberg is of the Swedish Engineers' Press, Stockholm.

The book is divided into eleven parts, each containing from 2 to 6 articles. Of the authors and joint authors of the articles, 16 are from Sweden, 14 Denmark, 6 USA, 5 Finland, 4 West Germany, 3 Egypt, 2 each Norway and Italy and one each from Belgium, Czechoslovakia, Netherlands and Scotland.

In Part I there are 5 articles of a general character including the interest and activities of NATO in the environmental and other problems of modern society, environmental engineering as a source of new industries, re-use of wastes, the development of chemical industry with emphasis on air and water pollution, and location, size, and interaction of chemical plants. There are two parts, II and III, containing 5 general articles on air pollution, 6 on industrial examples and engineering, including sulphuric acid and nitric acid plants, fertilizer industries, petroleum refineries, the cement industry, and on the calculation of mist eliminators for industrial gases. Part IV has three articles dealing with air pollution measuring networks and remotely controlled SO<sub>2</sub> monitors, gas-analytical supervisory control in air pollution, and recent advances in automatic, continuous chemical analysis, monitoring and control. Parts V to IX discuss various aspects of problems of water pollution divided into 3 general articles, 6 classed as industrial examples and engineering, 3 on analysis and monitoring control, 2 classed as reverse osmosis, and 4 on chemical and biological effects.

Part X headed 'Soil-General' has an article on value flow analysis of chemical reprocessing of solid waste and one on waste refining. The final part, XI, headed 'Solids Industry—Community Engineering' has articles on waste destroying by fluidization techniques, low-temperature waste solidification, leaching from landfills, chemical engineering aspects of waste—a study of pig slurry from pig farms, and on composting of wastes.

There is thus a total of 44 articles covering about 385 pages of text, after allowing for blank pages and parts of pages separating the various parts and articles; there are between 400 and 450 words to a page of text. The general articles in Part I occupy about 45 pages of text leaving about 340 pages to cover scientific and technical aspects of air pollution, water pollution and solid wastes. Obviously the important scientific and technical aspects of these subjects cannot be covered reasonably in such a limited space. In addition there does not seem to have

been good initial planning of the subjects of the articles or of the space to be allotted to each article. For example, the article on mass transfer with chemical reaction in Part II occupies 12 pages, whereas in Part III the article on the Swedish fertilizer industries occupies only 2½ pages and that on air and water pollution problems at petroleum refineries occupies only 4½ pages. There are other examples of lack of balance, though it is recognized that some authors will write articles much shorter or much longer than planned by editors.

It is not clear for what class of reader the book is intended, whether readers generally interested in problems of reducing air and water pollution or readers with a fair knowledge of science, chemical engineering and industrial technology.

A. Parker

Reader Enquiry Service No. 7436

## Odours

**Report of the Working Party on the Suppression of Odours from Offensive and Selected Other Trades.**

**Part 1 Assessment of the Problem in Great Britain**

*Published on behalf of the Department of the Environment by the Warren Spring Laboratories, 1974. Price £2.50.*

This report has been long awaited. The Working Party was constituted in June, 1971 with the following Terms of Reference: "To examine the problems of unpleasant odours emitted by offensive and selected other trades, and to make recommendations about the best practicable means for their minimization and suppression."

At the outset the Working Party state: "While our final conclusions will be drawn in Part II, we can say at this stage that careful design of processing plant and equipment, good maintenance and housekeeping and adequate scheduling of transport and storage can go a considerable way towards prevention and alleviation of odour problems. We found that proper design and operation and maintenance of abatement plant are often neglected. We still consider, however, that complete answers to many industrial odour problems do not exist at present, although we are confident that these can be found by an intensive programme of research and investigation over a limited period of time and this we strongly recommend."

The report first considers the problems of odour perception and then discusses odour generation. The "offending" industries are then dealt with in turn and in great detail. It has been said that as the smoke has abated as a result of clean air legislation, so malodours seem to have become more apparent. The report leaves no room for doubt that there are a considerable number of processes which do give rise to odours. This may come as a surprise to some people, but it could indicate

that in many cases the degree of control applied is effective. This is not to say there are no complaints: there are many complaints and, for a variety of reasons, these are not easy to deal with.

The report contains a number of appendices one of which examines existing legislation, and states: "The members of the Working Party are somewhat divided in their views of the legislative position." Nevertheless it was generally felt that bye-law control of offensive trades had been rather uneven and ineffective in its application and that a possible alternative would be to have regulations which were more generally applicable and could provide more uniformity. The report notes a further interesting alternative in the state legislation of Victoria, Australia, where the control of odorous emissions is obtained by their 1958 Clean Air Act. This Act requires that all plants emitting "air impurities" use the "best practicable" means to prevent or minimise the emission of such "impurities" which include odours.

Altogether this is a most interesting report and it will become, we are sure, a standard work of reference.

Reader Enquiry Service No. 7437

**Évaluation du coût de la prévention de la pollution atmosphérique dans l'industrie en France. Situation en 1970 et prévisions pour la période 1971-1975 (VI<sup>e</sup> plan).** Published on behalf of 'Environment' by La Documentation Française. Paris 1974.

This study was commissioned and financed by the Ministry of Scientific and Industrial Development and carried out by R. Bouscaren, Engineer E.P.C.I. under the direction of J. P. Detrie, Director of C.I.T.E.P.A.

Written in French, it is a comprehensive study of the cost of controlling atmospheric pollution in French industry.

Reader Enquiry Service No. 7438

**Consumers' Guide to the Protection of the Environment. Revised Edition.** Jonathan Holliman. Published by PAN/Ballantine in association with Friends of the Earth. 50p.

This book looks at several major areas of goods and services and explains, simply and clearly, the environmental costs of their production, use and disposal.

Holliman claims that 'By seductive and clever advertising and salesmanship, we are constantly brainwashed to consume what the manufacturer wants us to, and not what we really need'. He states that 'In many cases it is extremely difficult to get "the facts" because industries and government departments maintain a policy of secrecy that leaves communication or information up to public relations men and politicians'.

The author attacks the advertising industry for 'Deceiving customers as to the real merits of a product and to substitute appeals to emotions of fear, personal insecurity, social embarrassment, greed, hypochondria or social status'.

Some of his further comments are:

On Clothing and Fashion: 'Resist the advice of fashion experts. They make their living out of telling you how to consume more than you need'.

On Overpopulation: 'The family that willingly has a large number of children is clearly placing a burden on

society—a morally questionable act'. If people want more than two children?—'Adopt them'.

On Noise: 'Respect your neighbours by controlling the level of noise that comes from your home'.

On Detergents: 'The high promotional costs, the confusion of changing prices, different sizes and brand names, make it almost impossible for the housewife to get value for money'.

On Transport: 'The car has become one of the most powerful tools of psychological manipulation and consumer enslavement ever devised'. 'Reduce the impact of your car by sharing'. 'Support schemes to prevent cars from entering city centres'.

This is an easily readable book and the arguments, with which we do not always agree, are clearly presented.

Reader Enquiry Service No. 7439

## New additions to the National Society for Clean Air Library, available on Loan

**Friskén, W. R.** The Atmospheric Environment of Cities and Larger Areas. The Johns Hopkins University Press. March 1974. £1.70.

**Zupan, J. M.** The Distribution of Air Quality in the New York Region. The Johns Hopkins University Press. March 1974. £1.70.

**The Inland Shipping Group of the Inland Waterways Association.** A National Commercial Waterways Project. Barges and Juggernaut. 50 pence.

**Lundström, Sven, Editor.** Environmental Research 1971/2. National Swedish Environmental Protection Board.

**Verein Deutscher Ingenieure;** VDI Berichte. Ausbreitung Luftverunreinigender Stoffe. (Some English Translations.)

**Lindner, G. & Nyberg, K.** Environmental Engineering. D. Reidel Publishing Company. Dordrecht, Holland. Boston, U.S.A.

**Department of the Environment.** Odour. Report of the Working Party on the Suppression of Odours from Offensive and Selected other Trades. Part 1, The Assessment of the Problems in Great Britain. Warren Spring Laboratories. 1974. £2.50.

**Holliman, J.** Consumers' Guide to the Protection of the Environment. PAN/Ballantine in association with Friends of the Earth. 50p.

**Évaluation du coût de la prévention de la pollution atmosphérique dans l'industrie en France. Situation en 1970 et prévisions pour la période 1971-1975 (VI<sup>e</sup> plan).** Published on behalf of 'Environment' by La Documentation Française. Paris, 1974.

"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## AUSTRALIA

### Deep-Freeze Plan for Old Tyres

An Australian engineer claims a major breakthrough on the problem of disposing of old car tyres. He is Dr. John Barnes, chemical engineering lecturer with the New South Wales Institute of Technology, Sydney, and his technique involves freezing the tyres to almost 200 degrees Centigrade below zero. Dr. Barnes said that the tyre becomes brittle like glass and can be smashed into small particles in a special crushing device. After that, particles are further reduced into re-usable rubber by-products.

Disposal of old car tyres is one of Sydney's growing pollution headaches. Sydney motorists throw away more than two million car and truck tyres a year.

Dr. Barnes is undertaking extensive experiments to test uses for the frozen tyre by-products. He said applications included rubber surfacing for school playgrounds, running tracks and basketball fields. "Laboratory tests have been very encouraging in this area," he said. As well, the by-products mixed with bitumen and sand have applications for road surfacing in difficult areas. Every motorist is familiar with the fact that in wet weather certain intersections and curved sections of expressways become virtual skating rinks. This is because the coefficient of friction has been reduced by a polishing action. Special mixtures incorporating the rubber fibres from tyres have the effect of markedly improving the coefficient of friction, at least under laboratory conditions."

Dr Barnes said the reclaimed rubber could also be used for carpet backing and industrial floors. The fine rubber particles even have certain properties as a soil conditioner for gardens.

He said that present disposal methods were difficult and expensive. Tyres are either buried or burnt in specially constructed furnaces. Most councils refuse to take them at local dumps because they present an air pollution problem if they catch fire; and even if they are covered with soil, they tend to work their way to the surface. Tyres don't decay to any great extent in the soil.

Dr. Barnes said the by-products would pay for the cost of freezing and crushing the tyres. Tyres could be dumped at a central crushing plant and the community would be rid of a pollution problem at no charge. Steel-belted radials presented no problems and could be handled in the same way as conventional tyres. Two large Sydney companies are co-operating with Dr. Barnes in his studies.

Dr. Barnes added, "We anticipate that final large scale experiments will be done within the next few months to determine the economic feasibility of the process. The engineering problems have virtually been solved".

## SPAIN

According to statistics, 5,900,000 tons of pollutants were emitted into the atmosphere last year; that is equivalent to 175 kg per person. The experts predict that 6,500 million francs will be needed to control atmospheric pollution alone over the next 10 years.

## IPIECA

At a meeting in London on 13th March, 1974, representatives of many leading oil companies and oil industry associations agreed to set up the International Petroleum Industry Environmental Conservation Association.

The purpose of IPIECA is to co-operate with and to represent the views of its members to the United Nations Environment Programme and other international organisations concerned with environmental protection. It will provide a readily available source of environmental information on the industry. The initiative has been warmly welcomed by Mr. Maurice Strong, Executive Director of the UN Environment Programme.

Membership of IPIECA is open to any petroleum enterprise anywhere in the world—whether private, public or government-owned—which has international operations or interests in production, transportation or refining of petroleum; and to any industry association, international or national with environmental interests in these phases of the oil industry.

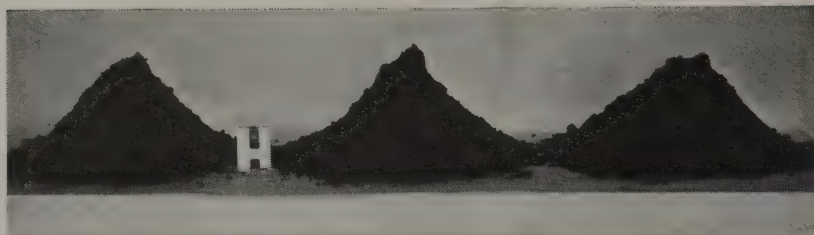
IPIECA will have headquarters in London with a small permanent staff and will work wherever possible through existing oil industry associations.

## FRANCE

An international convention was adopted at the 3rd session of the Conference on the prevention of maritime pollution from land-based sources, held in Paris from 19 to 21 February. This convention, which supplements, as regards the protection of the Channel, the North Sea and the North-East Atlantic, the Oslo Convention on the dumping of toxic substances, embodies the obligation of signatory states to eliminate or strictly decrease sea pollution from land-based sources (two lists of such substances have been drawn up) and the creation of a commission to work out schedules for its application on the basis of information provided by the states and an international observation network. Fifteen countries took part in this conference and in the drafting of this convention, which was to be opened for signature by the states on 4 June.

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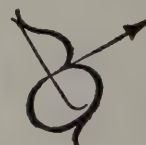
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# INDUSTRIAL NEWS

## Europe's first reservoir liner of "Hypalon"

Europe's first reservoir liner of "Hypalon" synthetic rubber has been completed. It lines a  $56.5 \times 64.5$  metre emergency pond at a large chemical plant in the Federal Republic of Germany. Although such liners have been used for some years in the United States to conserve fresh water, contain effluents or to prevent underground pollution, this is the first one in Europe to be made of "Hypalon". It is installed at the Uentrop (North-Rhine Westphalia) Works of Du Pont de Nemours (Deutschland), where three multimillion dollar plants produce synthetic fibres and plastics.



Purpose of the emergency reservoir is to hold process effluent from the nylon and polyester plants if the biological treatment installation at the Works should be temporarily out of action. (This installation uses bacteria to break down the chemical content of the effluents into harmless ingredients which may be discharged into the local river.) The reservoir is also linked to the main sewer system in such a way that if there should be a chemical spill at the Works, the spilled chemicals which are washed down the sewers can be channelled into the reservoir instead of flowing directly into the river, thus eliminating the possibility of pollution.

An important aspect of the problem to be tackled was that the effluent, which can contain undesirable chemicals, may have to be retained in the emergency pond for as long as 30 days. An earthwork embankment without any lining could not have met this requirement: seepage leading to underground pollution would have

resulted. A concrete liner was dismissed as being unnecessarily expensive. It was decided that a type of flexible sheeting was the ideal material for lining the pond. A number of factors were taken into consideration in selecting the material for the liner. The main questions that Du Pont engineers asked were these: What is the material's strength when seamed? Can it be seamed on site and still stay leakproof? Has it the required resistance to chemicals? How well does it resist weathering? What are installation and maintenance costs? How long is it expected to last? And what is its cost per year of useful life?

Based on these criteria, "Hypalon" synthetic rubber was selected. The material for the liner at Uentrop was manufactured by a French company, Pennel & Flipo, in 1.50 m-wide sheets. The sheets were hot-air welded by another French company, Fipec International, into four panels measuring about  $70 \times 16$  m each. The panels, weighing about 1.3 tons each, were folded and rolled up, and transported by road from the Fipec plant at Etaples, northern France, to Uentrop.

On arrival at the site, the rolls were placed on top of the 5 m high embankment, unrolled into the reservoir and unfolded. The overlapping panels were joined with an adhesive based on "Hypalon"; the edges of the liner all round the reservoir were held fast on top of the embankment by burial in a trench.

There is a ten-year guarantee on the material, but the liner is expected to last considerably longer than that. The material cost plus installation was about DM 48,000. The membrane has a total surface of about  $4,200 \text{ m}^2$ ; the cost per  $\text{m}^2$  installed was thus about DM 11.50.

The dimensions of the pond are  $39 \times 47$  m (base) and  $56.5 \times 64.5$  m (on dyke). The width of the dyke at the top is 1.40 m and the slope of the sides is 1:2. With a depth of 5 m, the pond when full holds about  $12,000 \text{ m}^3$ .

Reader Enquiry Service No. 7441

## John Zink Burners Aid Heat Conservation in Refineries

John Zink are supplying Esso, Antwerp, with six acid gas type burners designed to remove sulphur from a sulphur-rich refinery waste gas stream, and also to recover the heat liberated for re-use in further processes. The design of these burners was originally developed two years ago by John Zink, Tulsa, in conjunction with General Electric in the United States for use in total energy plants to boost the heat content of waste gases from gas turbines in order that they may be recycled.

The burners to be supplied Esso, Antwerp, will be installed in two combustion chambers on the sulphur recovery section of the refinery, and will burn about one-third of the total quantity of waste gas stoichiometrically reducing its hydrogen sulphide content to elemental sulphur. The heat liberated in the combustion chambers will then be used to produce steam in a waste heat boiler for use in the refining process, conserving a significant quantity of energy previously lost through the stack which carries combustion gases to atmosphere.

The order for Esso comprises two burners for the combustion of 8,850 kg per hour of acid gas containing about 92.5 per cent of hydrogen sulphide and various other impurities, and four sour water stripper gas burners for burning 635 kg per hour of gas containing about 38 per cent hydrogen sulphide, 40 per cent ammonia and water. The heat release from each of the former will be 10.53 million kilocalories per hour, and the latter 1.1 million kilocalories of heat per hour each.

The burner tips will be made in nickle-free chrome steel. The design operating pressure of the burners will be 15 lbs per square inch, and the burners will be mounted in two pear-shaped combustion chambers, with the acid gas burner firing slightly upwards, and the other two slightly downwards in the same pear-section of the chamber.

Reader Enquiry Service No. 7442

### **Fleet of 30 Harbilt mail vans now in service**

The electric mail vans manufactured by Harbilt Electric Trucks & Vehicles, featured in the Autumn 1973 issue of 'Clean Air', are now in service in the town of Cupertino, Northern California.

An average mail delivery route in Cupertino ranges from 8 to 15 miles with 100 to 300 stops—a job for which an electric vehicle is admirably suited. They have built-in mail sorting facilities and easy entry and exit for the driver, including a kerb-height floor. They are driven by a 12½ hp electric motor which is powered by a 72 volt Oldham tubular plate lead-acid traction battery of 282 Ah. capacity. They have a range of 50 miles and a speed of up to 30 mph. Apart from being cheap to run with the batteries being charged overnight, they require very little maintenance.

A study made during the trial period proved that four mail delivery vans powered by lead-acid batteries could be operated for the cost of operating one internal combustion engine. It is estimated that the new electric fleet will save some 23,000 gallons of petroleum a year.

Reader Enquiry Service No. 7443

### **New Gas Solids Collector**

At the HEVAC '74 exhibition at Olympia, London in April, F. E. Beaumont Ltd heralded a breakthrough in pollution control with the announcement of the patented Beauvent G.S.C. (Gas Solids Collector), which has been developed in conjunction with the British Petroleum Co Ltd.

The Beauvent G.S.C. can be fitted into the base of any new Beauvent chimney and tests have shown it prevents 65% or more of the grit and dust produced in oil fired burning being emitted into the atmosphere.

A model of the Beauvent G.S.C. was shown at the exhibition.

Reader Enquiry Service No. 7444

### **Total Pollution Cover—A New Facility for Industry Introduced by Clarkson**

H. Clarkson (Overseas) Ltd., part of the well-known London insurance brokers H. Clarkson & Co., announced on the 25th April, a new Environmental Impairment Liability (EIL) insurance policy which is being introduced worldwide to provide cover against any form of EIL "whether sudden, unintended and unexpected or not".

In close consultation with specialist consultants Environmental Resources Ltd., London, (ERL), a detailed rating guide has been developed, based on a scientific analysis of potential environmental impairment by industry. In assessing individual risks, underwriters will be assisted by a new environmental auditing and monitoring service, Environmental Risks Analysis Systems (ERAS) formed by Clarksons together with the Swiss Reinsurance Company and the Mercantile and General Reinsurance Company and ERL.

Arrangements are in hand for offering this insurance cover in many countries of the world and ERAS representative offices have been established in the USA, Canada, Brazil, Belgium, the Iberian Peninsular, Germany, Switzerland, Italy, France and Japan.

Reader Enquiry Service No. 7445

### **British Company Revolutionises Clean Air Machines with Systems Used in "Polaris" Submarines**

Renovair Limited, a company established recently at Guildford in Surrey, has developed a new machine for cleaning the air in boardrooms, offices and other places where there is considerable airborne refuse. The new product is called the 'Airmonitor'. A portable console unit which works off standard electricity supply, the 'Airmonitor' represents a technological breakthrough in cleaning air since it is based on the principles of electrostatic precipitation, rather than the use of chemicals such as Ozone. This means that air worked through the system is not treated chemically and does not smell.

Once dirty air enters the 'Airmonitor', dirt particles are trapped in a series of ionising and collector cells. The air is then passed through a special filter made of activated carbon granules. It is then discharged back into the environment through a brushed aluminium grille at an angle of 40 degrees—thereby establishing a uniform air flow pattern round the room.

Simple to operate and 'plug in', Renovair's 'Airmonitor' has three speeds—'High', 'Medium' and 'Low'. Switch positions control the throughput of air—hence 400 cubic feet of air per minute are handled on the 'High' reading, 300 cubic feet on 'Medium' and 225 cubic feet on 'Low'. Optimum room sizes for each of the three speeds are 4,000, 3,000 and 2,000 cubic feet.

Reader Enquiry Service No. 7446

### **Two-Stage High-Pressure Plastic Fans Handle Highly Corrosive Media**

Extraction of fumes containing highly corrosive media is a problem common to many process industries. To combat this problem, the Plastic Constructions Group have developed a range of Polypropylene Fans, handling volumes between 200 c.f.m. to 600 c.f.m. against pressures up to 30 inches static water gauge.



The units are available with belt drives or direct drives, dependent upon performance requirements and/or site conditions. The blades and back plate of the custom-designed Polypropylene Impeller are carefully machined to close tolerances in order to ensure high efficiency, and special seals are available to handle most corrosive media.

Reader Enquiry Service No. 7447

### **Liquid Waste Incineration System Combines Energy Conservation**

A waste disposal scheme using incineration with heat recovery and flue gas treatment for environmental protection is being supplied by John Zink Co. Ltd. to Glaxo Laboratories Ltd. for their factory at Montrose, Scotland. The process design was carried out by John Zink Co. Ltd. in close collaboration with Glaxo and the plant is scheduled to come on stream later this year.

The plant has been designed to incinerate 15,000 gallons per day of a high BOD chemical aqueous effluent which may contain up to 10 per cent of organic material and 10 per cent of inorganic compounds. Using heavy oil as support fuel it will, however, burn up to 2,000 gallons per day of waste solvents, including chlorinated material. The plant will be capable of recovering, in the form of steam at 150 p.s.i., some 40 per cent of the heat required and will include equipment for the treatment of the flue gases before discharge to the atmosphere to reduce unsightly water vapour fumes as well as fulfilling all statutory requirements.

Reader Enquiry Service No. 7448

### Conversion Programme Completes 10 Million Homes

The British Gas programme of conversion to natural gas achieved a significant milestone recently when the 10 millionth home was converted.

With conversion taking place simultaneously in the twelve gas Regions, it would have been difficult to select any one customer as the 10 millionth. But, to mark the occasion, each Region made a special presentation to one of its customers being converted. Those selected were being given the opportunity to install modern gas appliances.

By April 1976, over 97 per cent of Britain's 13.4 million gas users will have been converted, the remainder being completed by early 1978. In these concluding stages, the programme will be in its most difficult period—when, in the main, the areas to be converted are the densely-populated city centres.

The natural gas conversion programme began in 1967, building up rapidly the following year. It has included converting over 26 million appliances belonging to domestic, commercial and industrial users at a cost to date of about £400 million. The cost of the complete operation is estimated to be £530 million.

Reader Enquiry Service No. 7449

### Mobile Station for Measuring Air Pollution

A Dutch instrument manufacturer has brought on to the market a mobile measuring station for various types of air pollution. The automatic analysis equipment records not only traces of sulphur dioxide, but also the dust content of the air and traces of oxides of nitrogen, ozone and carbon monoxide. The mobile station also contains equipment to determine the wind speed and direction, the ambient temperature and relative humidity. Now the Netherlands-British Chamber of Commerce reports that: the values measured are registered by recorders and printed by an automatic typewriter. The data are stored on punched tape for central processing. Air samples can be taken from any height between 3 and 9 metres using a telescopic mast. The station, which is built on to a standard truck chassis,

is self-propelled and has its own electricity supply.

The automatic analysis equipment can also be supplied for use in non-mobile stations and laboratories.

The air monitor chosen for the measurement of oxides of nitrogen and oxidants was developed by the Institute for Health Technology of the Foundation for Applied Scientific Research (T.N.O.) of Delft. The analysis is based on a colorimetric measuring method with static calibration. The instrument's reagent consumption is only 0.1 litres per day, and the reagent remains stable for three months. The air monitor does not give a continuous average but provides a physical integration of an exact half-hourly or ten-minute average. CO is measured by means of an infra-red analyser. The air monitors used in the measuring van can measure SO<sub>2</sub>, NO<sub>2</sub>, NO, NO<sub>3</sub> and O<sub>3</sub> in the atmosphere.

In the design of the measuring van special attention has been paid to the energy supply. Because the maximum energy consumption, including air conditioning and battery charger, is only 3.5 kW, the van can be connected to a point with a 16 amp fuse. In addition there is sufficient battery capacity in the measuring van to run all the measuring equipment for more than 8 hours in the absence of a mains connection. If the station is to be used for long periods in places where connection to a lighting circuit is impossible, a mobile gasoline generator set can be supplied.

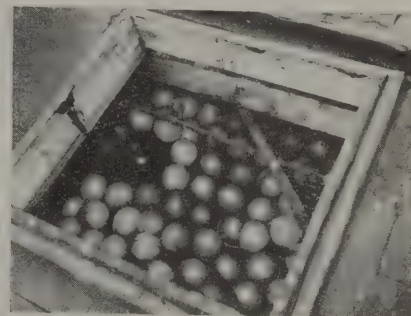
The mobile station measures 2.10 metres in width, 2.75 metres in height and 6 metres in length.

Reader Enquiry Service No. 7450

### Ball Blankets Slow Gas Intake by Liquids

Official tests conducted in France have confirmed British findings that Allplas ball blankets are extremely effective in reducing the rate at which liquids absorb gases. The blanketing technique, developed by Capricorn Industrial Services Ltd, consists of floating a closely packed layer of chemically inert hollow plastics balls on the surface of a liquid, primarily to reduce heat loss and loss by evaporation. Experience has, however,

shown that ball blankets also reduce the rate of oxidation of liquids. They are now widely used to prevent ingress of oxygen into condensate for boiler feeding, thus preventing boiler corrosion, for the preservation of wines, chemicals and other liquids exposed to atmosphere, and generally to slow down liquid/gas interaction.



Tests conducted at the French National Centre of Prevention and Protection provide accurate measurements of the reduction in the rate at which a liquid is contaminated by a gas when the liquid is covered with single or multiple layer of floating balls. The French report stresses that the reduction of interaction by a factor of nearly 4 is dependent on using Allplas balls with circumferential rim, to prevent rotation when floating. Without rim the rate of interaction may be increased rather than reduced, because wetted rotating balls increase the liquid/gas interfacial area whereas static balls reduce it.

The French tests augment official tests by the National Engineering Laboratory at East Kilbride, which showed that a single layer of Allplas balls reduces by 69 per cent the amount of fuel needed to maintain a liquid at an elevated temperature, at the same time reducing evaporation losses by 89 per cent, thus also virtually eliminating smells and fumes.

Allplas balls are made in diameters of  $\frac{3}{4}$ , 1 $\frac{1}{4}$  and 6 in (20, 45 and 150 mm). The diameter of balls used does not affect the results obtained since a complete blanket of spheres of any diameter always covers 91% of the surface of the liquid on which they float. The size of ball used is dictated by what is best suited to the shape and size of tank to be blanketed.

Reader Enquiry Service No. 7451

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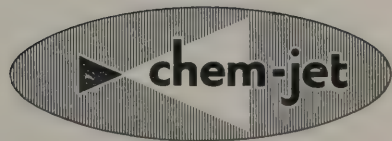
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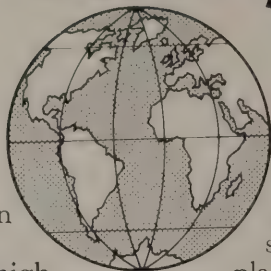
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# **CLEAN AIR**

*Incorporating "Smokeless Air"*

**AUTUMN 1974**

**VOL. 4 NO. 15**

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**The Elimination of Atmospheric  
Pollution from Coating and Drying  
Ovens.**

**D.C. Roots**

**The Future of Home Heating**

**I. C. Kirkwood**

**A New Energy Policy for the European  
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# CLEAN AIR

## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

Vol. 4 No. 15

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"This most excellent canopy, the air"

# CLEAN AIR

## New Legislation

On the 31st July last the Royal Assent was given to two Acts which will have a considerable effect on the control of pollution.

The first is the Control of Pollution Act which is in four main parts. Part one is concerned with waste on land, and contains a reformulation of the law on collection and disposal of waste by local authorities; it requires comprehensive plans for the disposal of waste and satisfactory standards of disposal. Part two of the new Act is concerned with pollution of water and extends the existing methods of protecting water from pollution to virtually all inland and coastal waters and it introduces new provisions to protect water from the risk of accidental pollution. Part three of the Act modifies the statutory nuisance code as it applies to noise and provides local authorities with new powers to control noise from construction sites and similar works, and empowers them to designate noise abatement zones in which they will be able to control noise from premises.

Part four deals with pollution of the atmosphere and contains a number of miscellaneous provisions relating to air pollution. The Secretary of State is given power to make regulations controlling the composition of motor fuel and the sulphur content of oil fuel. Other clauses empower local authorities to collect and publish information on air pollution in their areas, and an entirely new provision covers the burning off of cables to recover scrap metal.

The Act covers a lot of ground, but the part which refers specifically to air pollution is comparatively small. Nevertheless, the clause empowering local authorities to collect and publish information on air pollution represents an advance and is something with which the Society has been concerned for some time.

It is not yet known when the various provisions of the Act will come into force, but it is expected that some of the regulations authorised by the Act will be introduced in the autumn of this year, and that further regulations will be introduced in the spring of 1975.

At first sight the other Act, the Health and Safety at Work Act, would not seem to have such an effect on the control of pollution. Obviously, as its name suggests, the main purpose of this measure is to provide for one comprehensive and integrated system of law dealing with the health, safety and welfare of work people, and the health and safety of the public as affected by work activities. It is this latter requirement which could have a profound effect on the existing legislation regarding air pollution, for the Act sets up a Health and Safety Commission and Executive to be generally responsible for administering "the relevant statutory provisions" and for the Commission and Executive to bring together all the various national Inspectorates concerned with health and safety at work and with the general public as affected by work activities, and for the Commission and Executive to exercise the responsibilities which hitherto were exercised by various government departments under existing Acts.

This means that in due course the Alkali and Clean Air Inspectorate will be responsible to the new Executive and the Commission, although it is expected that the Inspectorate will retain its identity as such within the Executive. On the 1st October 1974, the new Commission will be set up, and on the 1st January, 1975 the Executive will be set up and the various Inspectorates, i.e. the Alkali and Clean Air Inspectorate, the Factory Inspectorate, the Safety of Mines Inspectorate etc., will be merged. But the Act goes further than this. Some sections of the Alkali Act will be repealed on the 1st January, 1975 and replaced by regulations; the remainder of the Alkali Act will be repealed and replaced by regulations on the 1st April 1975. So by this time next year the Alkali Act, which has done so much for clean air in this country, which will have been in force in one form or another for some 112 years will no longer be on the Statute Book. It is not yet known exactly what form the new regulations will take, but it is known that the philosophy of "the best practicable means" will be retained.

Obviously it will take some time before the provisions of both these new pieces of legislation come fully into force, and it will take further time before their implications are fully realised. But their effects are likely to be far reaching and it is for this reason that a session at the Clean Air Conference, at Cardiff on Tuesday the 15th October has been set aside to discuss, in detail, the various provisions of this new legislation.

The matter does not end there however. The Secretary of State for the Environment has invited the Royal Commission on Environmental Pollution to undertake a study with the following terms of reference: "to review the efficacy of the methods of control of air pollution from domestic and industrial sources, to consider the relationship between the

relevant authorities and to make recommendations". The Commission have stated that their study will chiefly be concerned with the Alkali Inspectorate, (the Industrial Pollution Inspectorate in Scotland) and the air pollution aspects of the environmental health departments of local authorities. The Commission have asked for comment on the following:

The organisation, methods of working and effectiveness of both Inspectorates.

Liaison both between Inspectorates and other relevant organisations. Possible alternative arrangements.

The adequacy of present legislation and criteria—standards and "best practicable means"—and possible alternatives.

Responsibilities for setting criteria, taking into account the wider public interest and local geographical factors.

The relationship between air pollution and development control.

As a first step the Commission have attempted to define the aim of air pollution control, and they are asking for comments on their draft definition which is as follows: "The aim of air pollution control should be to achieve a situation in which:

1. Known risks to human health and safety, taking into account critical groups who may have particular susceptibilities, are avoided or if necessary eliminated.
2. (a) Possible but unproven risks to human health and safety.  
(b) Known damage to amenity, property and plant and animal life; and  
(c) Possible long term damage to the environment, are reduced to the minimum compatible with the wider public interest, including trade, economic and employment factors."

The Royal Commission has been enlarged to deal with this commitment and the following people have been invited to be associated with the Commission's review: Mr. P. Jacques of the T.U.C., Mr. G. E. Speight of the British Steel Corporation, Professor C. J. Stairmand of Loughborough University, Mr. A. E. R. Taylor, Chairman of the Clean Air Council for Scotland, and Mr. Jon Tinker, journalist. Professor Stairmand is a member of the Clean Air Council; Mr. Speight is a member of the Council of the Society and of its Technical Committee.

The Society has been asked to comment on the above and to provide evidence to the Royal Commission and steps have already been taken through the divisional organisation, and through the Council and its committees to collect evidence and comments, to prepare them and to submit them. But if any reader has comments which they would like to make they should be sent to the Secretary General of the Society, 136 North Street, Brighton, not later than the 30th September 1974.

Obviously it is impossible to forecast what the findings of the Royal Commission will be; it is equally impossible to suggest any changes that may be made in the legislation and pattern of the pollution control as a result of the recommendations made by the Royal Commission. But it can be said that as a result of their findings and recommendations some further changes are likely. So the next few months see the introduction of a new legislation which could in itself have a profound effect; and six months after that legislation takes effect, the Royal Commission on Environmental Pollution will be making its report to the Secretary of State and the recommendations in this report could result in more changes. It is to be hoped that these will be for the better. Our existing legislation is by no means perfect, but over the years it has been administered by some very devoted people, both centrally and locally, with outstanding success; cleaner air has been achieved. Undoubtedly the air can and should be made even cleaner, and any new legislation will obviously be designed to this end. But in making changes we should be slow to forget that although the existing legislation may have gaps, it has worked.

---

## COMBUSTION-GENERATED AIR POLLUTION

A one week course on Combustion-Generated Air Pollution will be held at Cranfield Institute of Technology, School of Mechanical Engineering from 4-8th November, 1974.

The course will be of greatest benefit to students with a university degree or equivalent professional qualification in a science or engineering subject. The course is intended to serve the needs of those engaged in engine and combustion system research and development, and should also be of value to local authority staff and others concerned with the control of air pollution and enforcement of standards.

Course fee is £75, which will include board and accommodation during the course in one of the Halls of Residence.

Further information can be obtained from: Dr. P. T. Hinde, School of Mechanical Engineering, Cranfield Institute of Technology, Cranfield, Bedford.

# The elimination of atmospheric pollution from coating and drying ovens

by

D. C. Roots, Hygrotherm Engineering Ltd.

It is customary, in large-scale impregnating, painting and coating processes, to use ovens for drying and curing. These ovens generally have facilities for heating and air movement, including internal recirculating and exhaust. Large volumes of air containing hydrocarbon contaminants used to be discharged into the atmosphere, but the laws in many countries now prohibit such discharges and require the user to provide equipment capable of efficient clean-up. There are several possible means of dealing with hydrocarbon fumes, including washing or scrubbing, absorption, catalytic incineration and thermal incineration. In practice the statutory limits on the permitted concentration of hydrocarbons in the effluent can only be met on a continuous basis by thermal incinerators.

The principles involved in the design of these incinerators are by now well known, namely temperature, residence time, and turbulence or efficient agitation of the fume within the furnace. However, the high cost (and the availability possibly) of gaseous and liquid fuels, requires the designer to incorporate the most efficient means of fuel saving into the system. In this paper three systems in current use are discussed, each having different combinations of heat recovery apparatus tailored to the specific needs of the process.

## The Incinerator

The incinerator used in the systems is the Hirt/Hygrotherm unit which was developed in California over a period of twenty years specifically for the purpose of destroying hydrocarbons in air streams. Figure 1 is a cross-sectional diagram of a Hirt incinerator. It illustrates the fume inlet plenum, the multi-jet burner, the furnace and furnace baffling. The Hirt incinerator has special features incorporated into the design to ensure effective destruction of hydrocarbons at minimum operating costs.

These are:

- A proportion of the fume is internally by-passed through the burner for use as combustion air. Eliminating the need for outside combustion air saves approximately 30 per cent on fuel cost.
- The gas burner flame is short and has a wide, flat profile, which is ideal for incineration.
- The fume has to pass across and through the flame front in passing from the inlet plenum to the furnace. This provides the initial rapid heating required to achieve efficient oxidation.
- The furnace is baffled to achieve the highly turbulent mixing conditions which provide high destruction efficiency with minimum furnace temperature (and fuel cost) and residence time (furnace volume).
- The fuel gas usage is automatically reduced as the solvent concentration increases, thereby making efficient use of the calorific value of the gases in the oven effluent.

Control of the furnace temperature is fully automatic via the furnace temperature controller and the gas (and/or oil) flow control valve. A full range of gas (and/or oil) burner control equipment is provided, including the sequence start control, pilot burner with flame sensor, ignition transformer and spark electrodes, main and pilot gas shut-off valves. Gas (and/or oil) and combustion air pressure switches are interlocked with the burner controls to ensure that the burner cannot run in a dangerous condition. The controls are housed in a fully enclosed panel mounted on the incinerator base.

## System One

This system is designed for ovens in which aluminium foil is painted or coated. The ovens were direct gas-fired and discharged the solvent-laden air directly to the atmosphere. In the new system illustrated in Figure 2, the exhaust fume is taken from the fans to a common header duct via pressure controllers which ensure that the system operates satisfactorily under various loadings. The exhaust duct is taken to the incinerator forced draught fan which blows the fume through the preheater (2) where it is raised in temperature, before entering the incinerator inlet plenum (5). After passing through the incinerator combustion chamber (1) the flue gases re-enter the fume preheater (2) and then the two fresh air heaters (3 and 4) before entering the chimney.

Fresh air to the ovens is blown by forced draught fans through the air heaters to the oven burner boxes (7 and 8).

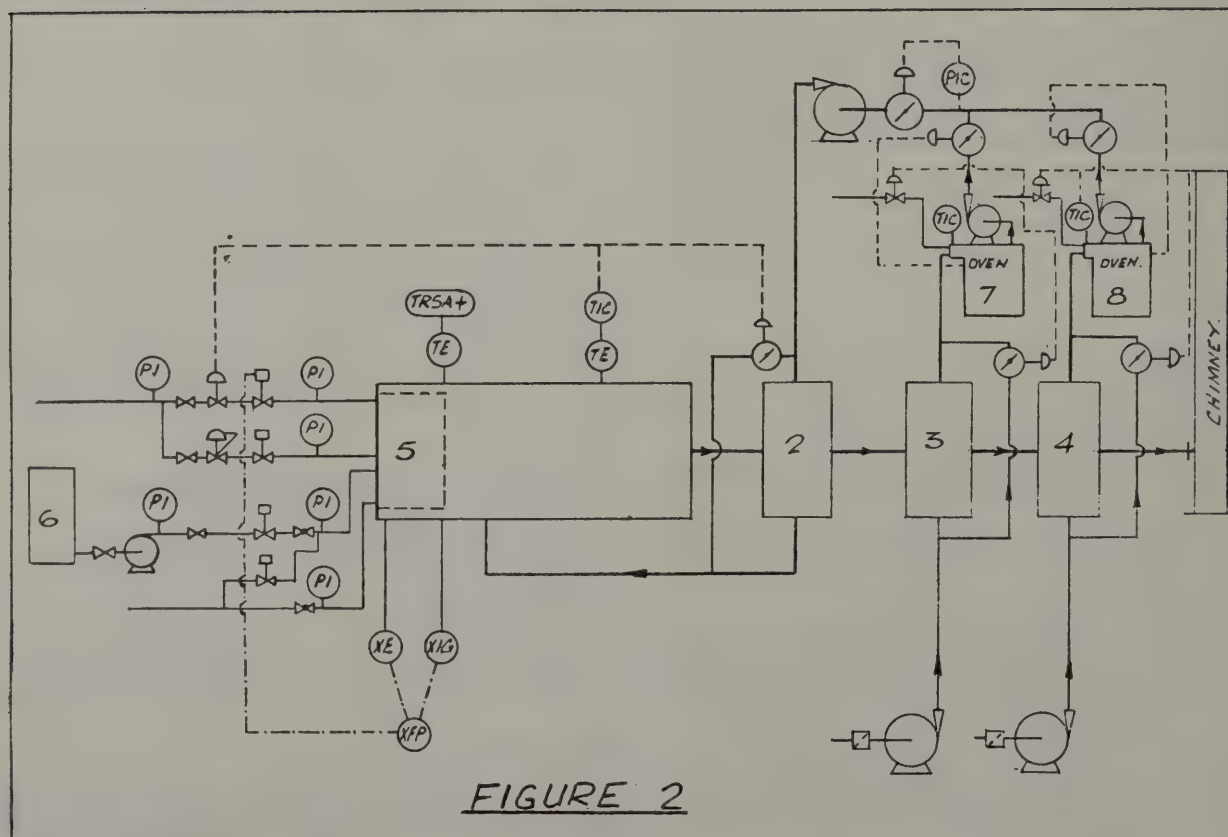
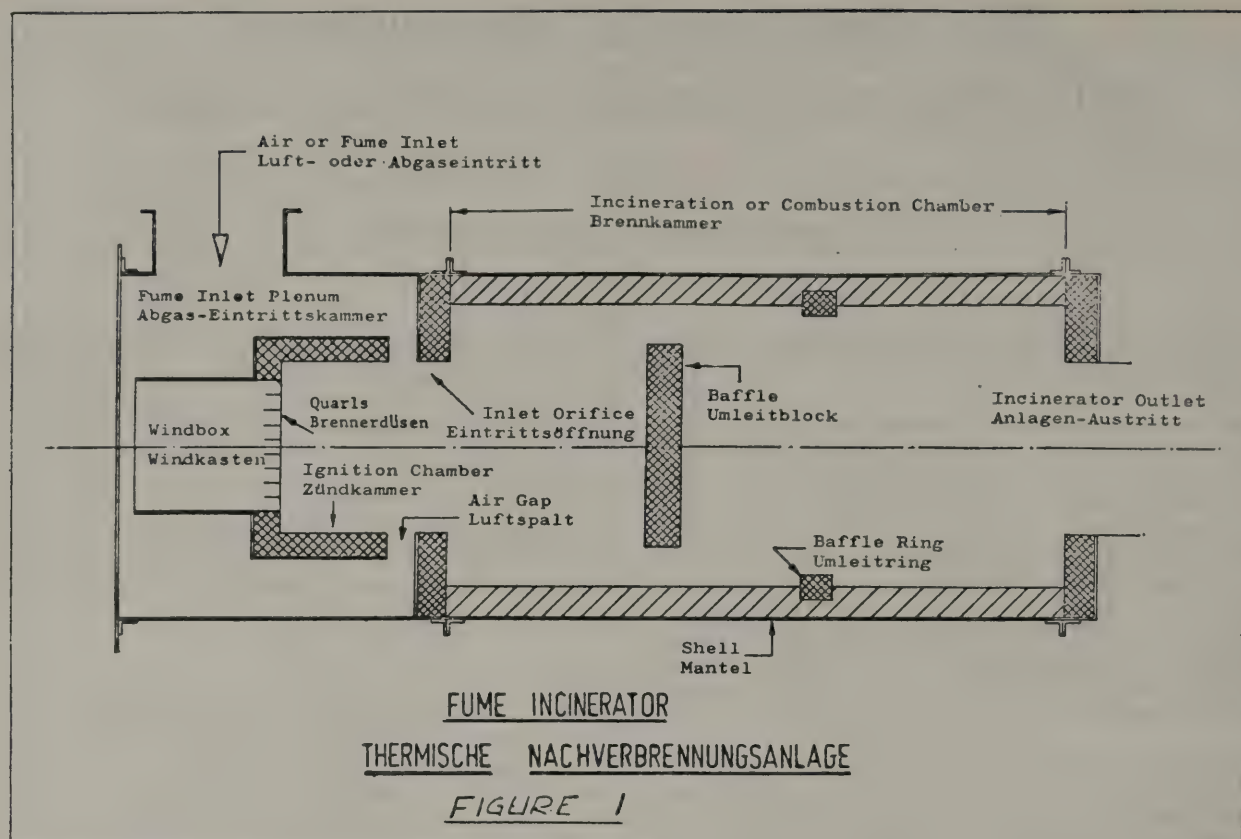
Control of the incinerator temperature is achieved by a modulating split-phase system operating on the fuel valve (normally), and on the fume preheater by-pass if the calorific value of the fume is high. Control of the oven temperatures is individually attained also by means of a modulating split-phase system operating on the by-pass damper around the heat exchanger, and on the oven burner fuel valve. Normally all the heat required is provided by the heat exchangers and the burners are required to operate only during the warm-up period.

## Details of the System

Air Flow	: 32,000 NM <sup>3</sup> /hr.
Incinerator Temperature	: 700°C.
Total Heat Demand	: 5.2 Gcal/hour.
Heat Recovered	: 4.7 Gcal/hour.
Percentage Heat Recovery	: 90 per cent.
Fuel	: Natural Gas.
Effluent Gas Analysis	: Maximum 250 Mg C/NM <sup>3</sup> .

## System Two

In the manufacturing of electrical insulating materials, paper is heavily impregnated with synthetic resins and cured in ovens. The exhaust air from the oven contains



hydrocarbon solvents and also resin droplets, causing both pollution of the atmosphere and solid deposits in the immediate locality of the exhaust duct.

Heating was provided, in several independent zones, by air heaters or radiators in which high pressure water was recirculated from a remote heating centre. When the incineration system was designed, it was clear that a form of liquid heating should be retained if possible—in the event, Marlotherm was chosen. The system is illustrated in the diagrams Figures 3A and 3B. Fume was ducted from the oven as it had been before the incineration project, but was now taken to the fume preheater where the temperature was raised by heat exchanged from the outgoing flue gases. The preheated fume enters the incinerator plenum and thence into the furnace section, before leaving via the fume preheater previously mentioned.

At this point the heat remaining in the flue gas is substantial and further recovery is effected by heating Marlotherm heat transfer fluid in a specially designed heat exchanger, and thereafter the flue gases are vented to atmosphere through the chimney.

Control of the incinerator furnace temperature is achieved by the same modulating split-phase system as in the first example, which operates the fuel valve (normally) and the fume preheater by-pass if the calorific value of the fume is too high.

Each section of the oven is required to be independently controlled. Air temperature controllers operate throttling valves in the Marlotherm lines leading from the main circulating system. The temperature of the Marlotherm is controlled in the flow main to the oven by the incorporation of a 'heat sink'. Any imbalance in the supply and consumption of heat is adjusted automatically by varying the extraction of heat by the 'heat sink'.

The compact arrangement of the heat exchange package is shown in Figure 4.

Because the incinerator is the primary source of heat, special arrangements are made in the design for starting up. A system of motorised valves is arranged to close the fume line and to admit fresh air to the incinerator. This arrangement allows the Marlotherm System and the oven to be heated up rapidly with the minimum expenditure of fuel.

A substantial bonus can be earned by the use of Marlotherm which is capable of operation at much higher temperatures than high-pressure water. The higher air temperatures made available by the higher fluid temperatures are used to effectively uprate the oven duty and to increase the production.

#### *Details of the System*

Air Flow	: 20,000 NM <sup>3</sup> /hour.
Incinerator Temperature	: 760°C.
Total Heat Demand	: 3.7 Gcal/hour.
Heat Recovered	: 3.1 Gcal/hour.
Percentage Heat Recovery	: 84 per cent.
Fuel	: Gas Oil.
Effluent Gas Analysis	: Maximum 70 mg C/NM <sup>3</sup> .

#### *System Three*

The motor car manufacturing industries are large users of paint and the drying equipment discharges solvent (and pigment) laden air in substantial quantities. The need for incineration equipment is recognised in the industries and an actual installation is shown in Figure 5.

As in the previous examples, the fume is ducted to the fume preheater via the fan, and enters the incinerator plenum at an elevated temperature. The incinerated flue gas is cooled in the fume preheater.

The flue gas is clear and is suitable for recycling directly to the oven where the heat is used to the maximum possible extent. As the heat available in the flue gas is greater than the heat demand, fresh cold air is mixed with it to achieve the desired oven air temperature.

Control of the oven air temperature is achieved by the use of motorised valves in the flue gas and fresh air ducts which are automatically controlled by the oven air temperature instrument. Control of the incinerator furnace temperature is similar to Systems 1 and 2 with the furnace controller actuating the fuel valve and fume preheater by-pass in a split-phase arrangement.

The advantage of this system is the lower capital cost as compared with the other systems and marginally lower running cost. The lower capital cost is due, of course, to the absence of oven air heat exchangers, but it is emphasised that there are no detrimental effects of recycling flue gas, which is a mixture of nitrogen and carbon dioxide and the minute traces of hydrocarbons permitted under the effluent regulations.

#### *Details of the System*

Air Flow	: 40,000 NM <sup>3</sup> /hour.
Incinerator Temperature	: 700°C.
Total Heat Demand	: $5.038 \times 10^6$ Kcal/hour.
Heat Recovered	: $2.74 \times 10^6$ Kcal/hour.
Percentage Heat Recovery	: 54.4 per cent.
Fuel	: Natural Gas.
Effluent Gas Analysis	: Maximum 300 Mg C/NM <sup>3</sup> .

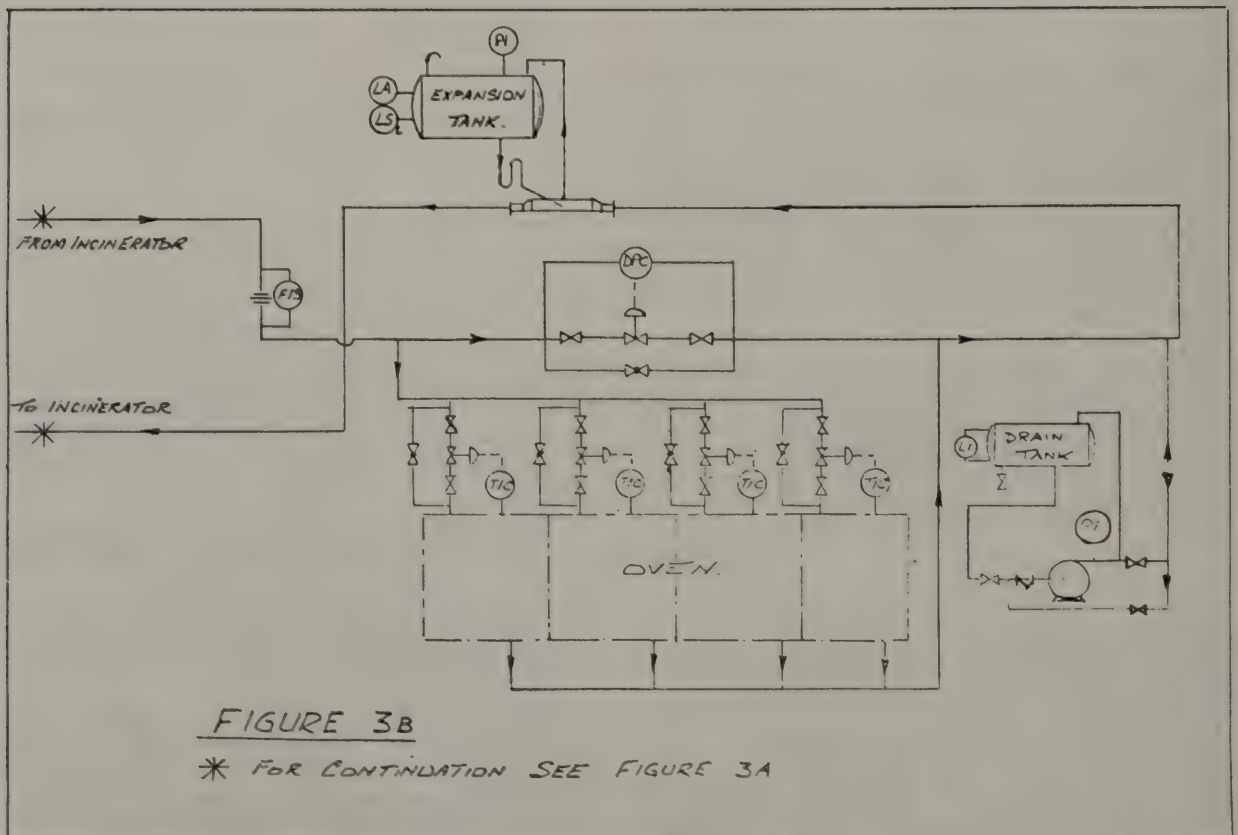
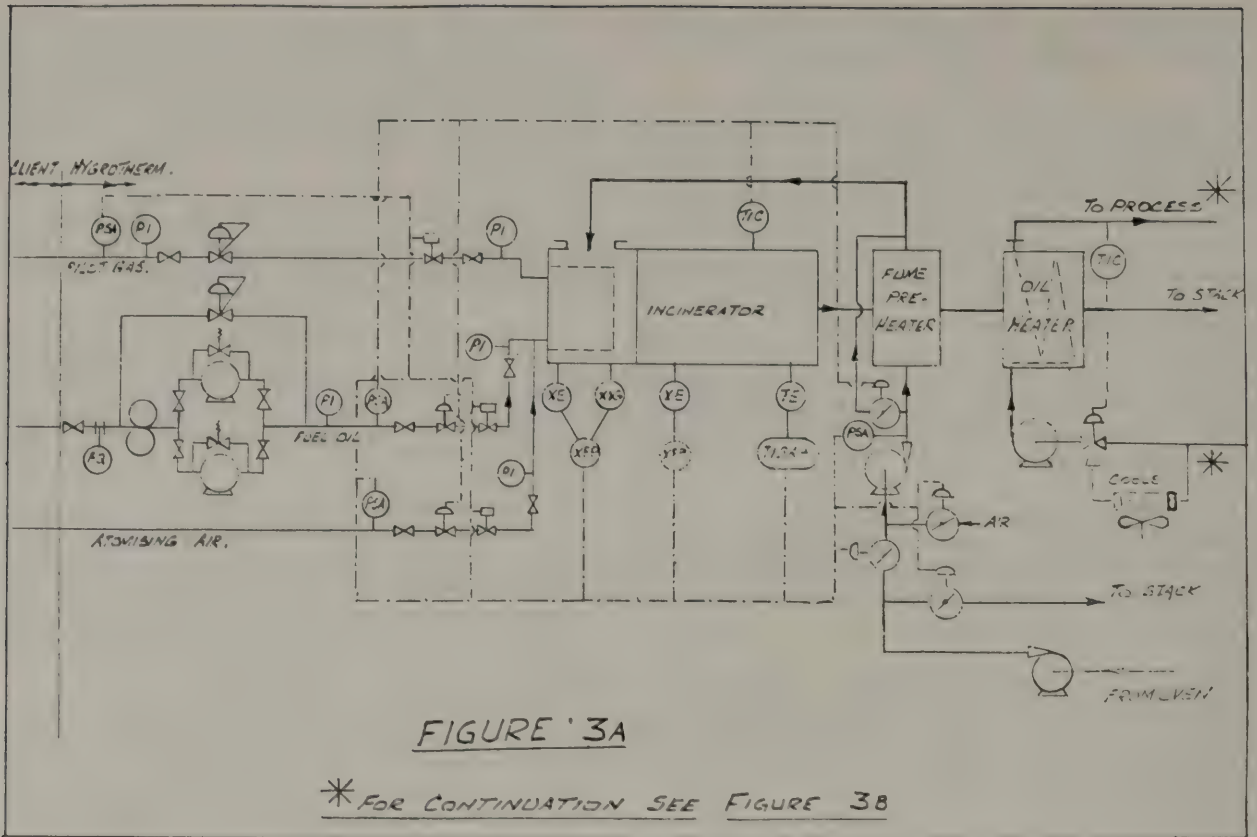
#### *Conclusions*

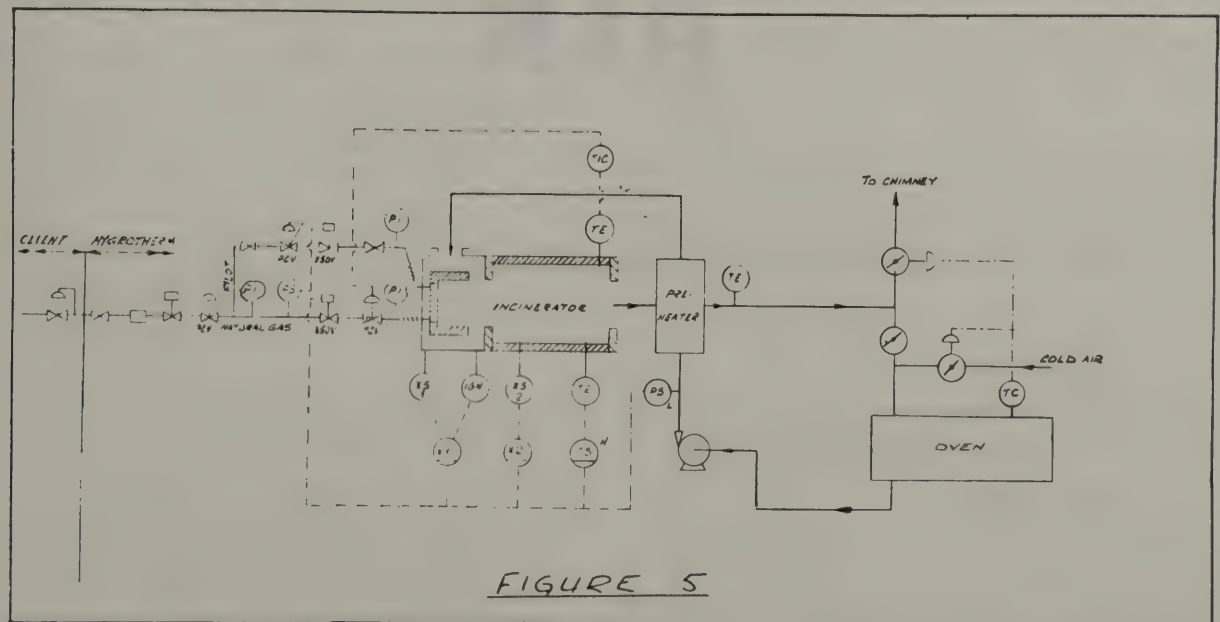
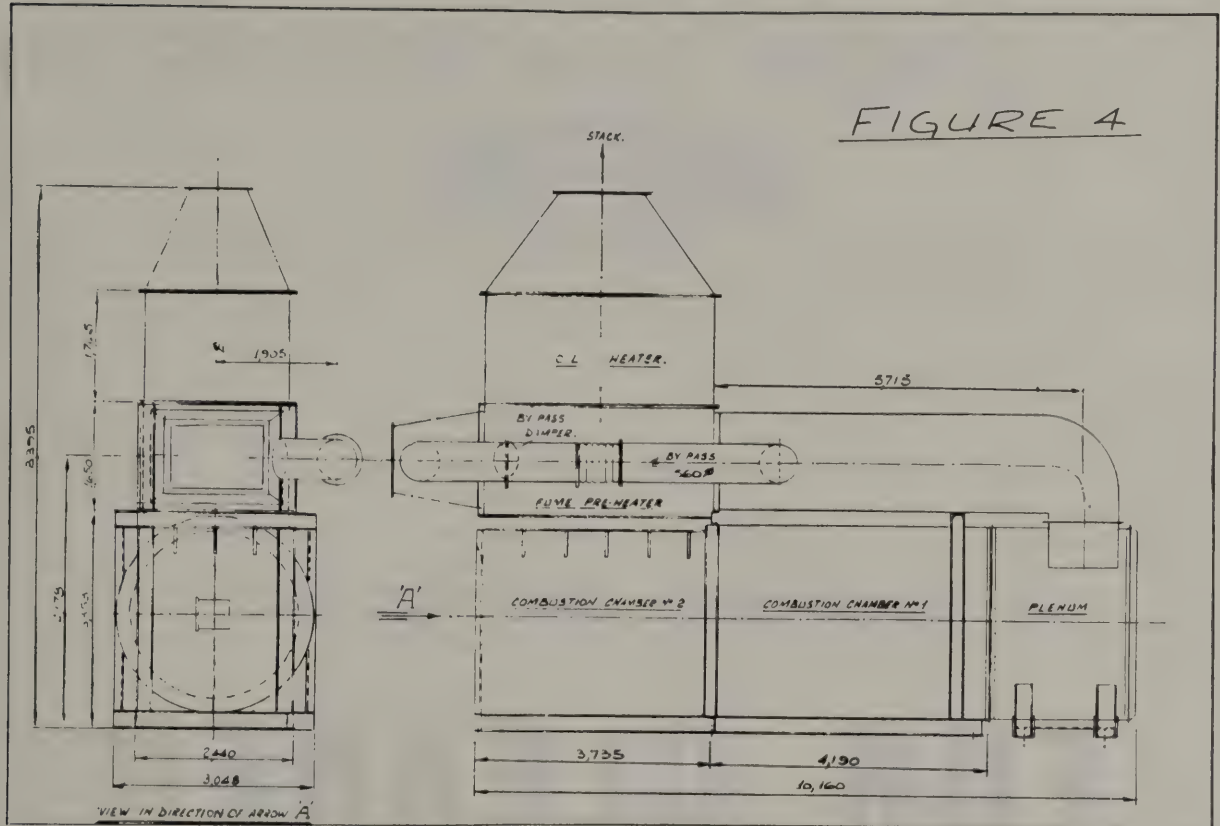
The incineration systems shown are operating in Europe and they represent the technology required to cover a very wide range of oven applications.

As the legislation in most European countries requires anti-pollution equipment to be installed, or is in the course of preparation for similar requirements, it is clear that both oven manufacturers and users must be aware of the implications. When considering the installation of incineration equipment, they should consider two aspects:

- 1 The destruction efficiency of the incinerator in oxidising the hydrocarbon, ie the guaranteed clean-up.
- 2 The thermal efficiency of the system as a whole, which will take into account the incineration temperature, the percentage heat recovery, and the nett heat demand or fuel usage.

Properly designed systems such as those illustrated in the text make the maximum use of the heat available according to the particular needs of the product and the existing machinery, while ensuring continuous clean-up of the fume within the statutory limits.







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# INTERNATIONAL NEWS

## USA

A simpler, single measure of what constitutes dangerous smog was proposed in March by the US Environmental Protection Agency. It would replace the present designation of three levels of photochemical oxidants judged to cause 'significant harm to health'.

The new standard would be 1200 micrograms per cubic metre of air (or 0.6 parts per million) over a one-hour period. The present standards are 800 micrograms, averaged over four hours; 1200 micrograms, two-hour average; and 1400 micrograms, one-hour average.

EPA said the three-fold definition was confusing and unnecessary, because State plans to implement the Air Pollution Control Act include specific actions to prevent the 'significant harm' level. Such contingency plans include shutting down industries, offices and businesses and limiting motor vehicle use.

These actions would be initiated in stages as oxidant readings reached three different levels; 'alert', 200 micrograms; 'warning', 800 micrograms; and 'emergency', 1000 micrograms (all one-hour averages).

Most urban areas in the United States, except metropolitan Los Angeles, have never had photochemical oxidant concentrations approaching the proposed level. Hourly averages of 1120 micrograms and 1260 micrograms were reported in the Los Angeles area in July 1973 and the 'significant harm' levels had been exceeded there 18 times in the previous 30 months.

### Fiftieth anniversary of the World Energy Conference

The Right Honourable Lord Nelson of Stafford has been selected to chair a special session at the Fiftieth Anniversary meeting of the World Energy Conference (WEC) in Detroit, Michigan, September 22-27.

This session, to be held on Friday, September 27, will feature prestigious world leaders commenting on areas of energy, environment and economics. Wilson W. Campbell, chairman of the WEC Programme Committee for Great Britain, will conclude with a summary of the six-day conference.

Lord Nelson, of St. John's Wood, London, is chairman of General Electric Co. Ltd. Campbell is Visiting Professor, University of Newcastle upon Tyne.

The week-long WEC is expected to attract 3500-4000 persons from 69 member nations. The conference theme is "The Economic and Environmental Challenges of Future Energy Requirements". Speakers now scheduled include United States Treasury Secretary William E. Simon. Dr. Albert Parker, CBE, a former President of the National Society for Clean Air will attend this Conference.

The first meeting of the WEC was held in London half a century ago.

## KENYA

The 3rd International Parliamentary Conference on the Environment was held at Nairobi, Kenya, in April. Following the example of the Scandinavian countries' convention, the parliamentarians:

- recommended notably that governments should take measures at international level, within the framework of the United Nations, to make a detailed study of the rational use of energy and to draw up an international programme to save energy.
- urged governments to conclude conventions and set up regional institutions responsible for co-operation and in particular the exchange of information on all environment matters; and to consider setting up appropriate machinery to achieve joint planning in frontier regions, particularly for land use, and to involve citizens on both sides of the frontier in these activities.

## EUROPE

According to studies carried out by the Secretariat of the United Nations Economic Commission for Europe, the heat output from thermal power stations in member States (excluding Canada, the USA and the USSR) was in 1971 already approaching the level at which, according to some meteorologists, climatic disturbances might occur. At current energy consumption growth rates, heat discharges will have quadrupled by 1985 and could perhaps be ten times their present levels in the year 2000.

The draft European Convention on the Protection of International Watercourses against Pollution was presented to the Consultative Assembly for opinion in May. Pending the decision to open the convention to signature, the Committee of Ministers had just adopted a resolution to establish:

- a committee of technical experts to complete preparatory work on the future convention and
- a committee of government experts to start negotiations for the drawing up of the lists still required of exceptions to the application of the minimum quality standards for water.

The departments of the European Commission has drawn up a preliminary report on problems of pollution and the harmful effects ensuing from energy production. In this the European Commission indicates a number of specific and urgent measures to be taken by the Community and its member States to bring each type of pollution under control as rapidly as possible. It refers in particular to pollution from sulphur dioxide, solid particles, nitrogen oxide and thermal discharge, which are regarded as particularly harmful to the environment.

# A New Energy Policy for the European Community

New measures to ensure the development of secure and low-cost supplies of energy in the countries of the European Community will be introduced if the Council of Ministers approve the recently-announced Commission proposals for a new energy policy.

The experience of the latter part of 1973 and the subsequent repercussions revealed the need for a long-term strategy aimed at reducing the energy dependence of the Community on external sources of supply, particularly oil. The objective must be to guarantee greater security of supply and to prevent violent fluctuations in the prices of energy materials, which prejudice investment, economic development, and the achievement of balance of payments equilibria.

The escalation in oil prices during the Autumn of 1973 changed the whole structure of energy prices. The Commission's analysis of the changed situation suggests a basis of a future Community energy policy. This would involve:

- (a) a slowing down in the demand for oil
- (b) the opening up of greater prospects for nuclear energy
- (c) an increase in the supply of natural gas
- (d) the growth of a more competitive Community coal industry, and the development of a greater potential market for imported coal.

In its policy the Commission proposes Community-level objectives for the relative shares of energy sources and processed energy in the overall energy market. These will, however, require the implementation of compatible energy strategies at the level of the Member States in order to achieve these aggregated Community-level targets. The strategy also sets out the specific actions which will need to be agreed and implemented in order to achieve the stated objectives.

## A. The long-term development

By the end of the century, nuclear energy and gas should be the predominant sources of energy supplies. In the year 2000, nuclear energy could cover at least 50 per cent of total energy needs. Nuclear energy, used

for the large-scale production of heat for electricity generation or for direct industrial uses, has the advantage of being a secure form of energy since it uses a raw material which is found in many parts of the world and which, furthermore, can be transformed into fuel in the Member States themselves. It also has the advantages of being easy to transport and store, and of being non-polluting. The protection of the environment from nuclear hazards must, of course, be assured, but this is perfectly possible.

Gas (natural gas and synthetic gas produced from oil or coal) could cover almost one third of total energy needs by the year 2000.

Thus by the end of the century, the Community could be dependent directly on coal and oil to cover only approximately one quarter of its energy needs. Certain quantities of oil and coal would also be used for gas production.

Non-conventional sources of energy (solar and geothermal energy) will by that time still cover only a minimal percentage of the needs.

## B. The objectives for 1985

On the demand side two targets must be set:

- a The rate of increase in the use of energy must be reduced without curbing the growth of the GNP, estimated at 4.5 per cent pa. This is possible. A more rational utilization of energy and a reduction in wasteful use should enable internal energy consumption in 1985 to be kept at a level of 10 per cent lower than forecast before the crisis, without the ultimate consumer being deprived of any energy.
- b Electricity consumption should gradually be expanded, without, however, increasing the dependence on oil, so as to ensure that 35 per cent of total energy is consumed in this form (25 per cent at present). This would create a much larger market for nuclear energy.

On the supply side, the targets should be as follows:

- a Nuclear energy to cover 50 per cent of the electricity production in 1985, so that a total nuclear power-station capacity of more than 200 GWe would be required in 1985 (11 GWe at present).

*Total primary energy needs in 1985 (1)—Community*

	1973 (estimates)		1985 (initial forecasts)		1985 (objectives)	
	Mill. toe	%	Mill. toe	%	Mill. toe	%
Solid fuels	227	22.6	175	10	250	16
Oil	617	61.4	1160	64	655	41
Natural gas	117	11.6	265	15	375	24
Hydroelectric power and other	30	3.0	40	2	35	2
Nuclear energy	14	1.4	160	9	260	17
	1005	100	1800	100	1575	100

(1) Internal consumption+exports+bunkers.

- b Internal production of solid fuel (coal, lignite, peat) should at least be maintained at its present level. Given a considerable annual loss of coal capacity this will require considerable investment. An increase in supplies of solid fuels above that which can be produced within the Community will have to be obtained by importing coal, at satisfactory prices and conditions of supply.
- c A substantial increase in the internal production and import of natural gas, given satisfactory price and security of supply conditions.
- d The consumption of crude oil to reach its peak in 1980 and return to its 1973 level around 1985. This would be achieved by more efficient use of available energy and the concentration of oil consumption in specific uses (e.g. as motor fuel and as a raw material).

### C. Dependence on imported energy supplies

It is not possible for the Community to achieve independence of imported supplies in the medium-term. However, the aim should be to reduce the share of imported energy in total consumption from 60 per cent to 40 per cent. After 1985 the exploitation of new sources used by Member States in the Community (e.g. North Sea oil and gas) will further reduce the part played by imports of oil from non-member countries.

*N.B.* It should be noted that the above figures and percentages are objectives and not forecasts. As objectives they must be revised periodically and adapted to the situation prevailing in each Member State. This task will be carried out by the Commission, assisted by the Energy Committee set up by the Council of Ministers decision of 30th January 1974.

Clearly, the pursuit of these Community-level objectives requires joint responsibility on the part of undertakings, the Member States, and the Community. The action of each should converge along the guidelines agreed on at Community level.

Furthermore, these objectives must be incorporated in the Community policies: environment, external relations, industrial policy, scientific and technical research.

### D. The policy for each energy source

In order to achieve the redistribution of the total demand for energy in 1985, projects must be commenced now to influence the supply and demand of each source of primary energy.

#### (a) Electricity and nuclear energy

The growth in the use of electrical energy cannot be more than marginally increased over the 7.2 per cent increase in demand in the nine Community countries over the past ten years. From 1985, however, a growth of 9 per cent could be achieved. Continuing expansion of the use of electricity will depend largely on the rational use of existing power stations plus the contribution from new nuclear stations which could become operative in the 1980s. If the nuclear power stations are to be operated economically it is essential that appropriate tariff and other policies should encourage a spreading of the load throughout the day.

In the production of electricity, coal could find a larger market providing sufficient quantities are available. From now on natural gas will in principle have to be reserved for uses other than fuel for power stations. For power stations burning oil, the long-term aim must be to restrict

their consumption exclusively to heavy residues from refineries. To achieve this aim, permission to build new oil-fired base-load plants must no longer be granted save in exceptional cases.

On the other hand, the production of nuclear power should be developed to the maximum. It is therefore essential that the Community's industrial capacities should be able to cope with building the new power stations in the time required, that the development of nuclear energy should not have adverse effects on the health of the general public or on the environment, and that the supply of nuclear fuels to these power stations should be secure. The Commission has already submitted proposals on this subject to the Council (COM (74) 10 and SEC (74) 4065 final) and is to take further initiatives in this field as soon as possible.

The objectives of 200 GWe of installed capacity by 1985 is an ambitious target, but providing the industrial capacity within the Community can be created it is capable of achievement.

In addition to electricity generation by 1985 about 20 GWe of nuclear energy will supply a process heat for industry.

The development of new reactor types will need to be encouraged. The fast breeder reactor will contribute to the security of uranium supplies, and the high temperature reactor will provide for a more economical use of energy by generating process heat. Both these reactor systems, separately and in combination, have advantages over existing nuclear reactors.

#### (b) Coal

With the rise in oil prices a large proportion of Community coal production is now competitive with other fossil fuels. Hence, present levels of coal production in the Community (around 250m tce) must at least be maintained. (This means maximizing production in Germany and the United Kingdom.) To achieve this will require rationalizing production; developing improvements in mining techniques; achieving a manpower policy based on attractive remuneration, secure career prospects, and improved working conditions for miners; Community action to finance investment, and appropriate pricing policies.

The potential market for coal in the Community will exceed the likely production potential. Hence, it will be necessary, without in any way prejudicing the maintenance of internal coal production, to increase imports of coal from non-member countries.

In order to provide a basis for the sustained production in the coal industry it will be necessary to secure outlets for the coal produced. Appropriate financial and administrative measures must be adopted to guarantee the competitiveness of consumers using Community coal, and to promote the use of coal for fuelling conventional power stations. An intensification of research into coal gasification will also be required to ensure the availability of appropriate technologies in the Community at the appropriate time.

#### (c) Natural gas

Between 1973 and 1985 gas could increase its proportion of fuel energy supplied from 13 per cent to almost 25 per cent. This implies a doubling of domestic production and increased imports. Measures must be

taken to encourage prospecting for new fields in the Community and imports must be increased through concerted efforts by the Member States to make new import contracts with non-member countries or to extend existing ones. The major provisions of such contracts would have to be notified to the Commission. Transport and storage systems must be improved and integrated on the Community-level in order to cope more effectively with seasonal variations in demand in the various regions, and to ensure continuity of supplies.

On the demand side, the uses to which the natural gas is put must be regulated in order to ensure its optimum utilisation. To this end the use of natural gas in new power stations should be subject to prior approval and its consumption in existing power stations progressively reduced. These measures should be accompanied by a harmonised Community policy concerning prices and tariffs.

#### (d) *Oil*

Even if the relative importance of oil as regards Community supplies is bound to diminish it will still remain in 1985 the main source of energy. Hence the Community must take every effort to ensure that sufficient quantities of oil are available at an acceptable price. The policy to be implemented in order to pursue this goal has four basic features:

1. *A joint attitude towards oil-consuming and oil-producing countries.* As regards the oil-producing countries, the Commission hopes that the proposals that it made in January 1974 will be discussed by the Council as quickly as possible. Until the Council has stated its attitude to the proposals, bilateral agreements should be subject to prior consultation at Community level. In relations with the oil-consuming countries, particularly the OECD countries, the Community must be able to speak with a single voice at all times.
2. *Development of secure resources.* Prospecting for oil and oil production within the Community must be stepped up. The oil industry would bear the brunt of the financial outlay involved, but in certain cases it should be possible for the Community to provide active assistance or information in order to promote or co-ordinate activities.
3. *Measures to be taken in the event of supply difficulties.* To offset the effects of future supply problems and yet maintain free circulation within the Community, the existing provisions in this field (in other words the Council Directives instructing the Member States to maintain a minimum level of stocks (1) and the Directive concerning measures to offset supply difficulties (2)) must be supplemented. Hence, an efficient and rapid information and monitoring system will be set up to cover movements of crude oil and petroleum products within the Community and imports and exports from and to non-member countries. In addition measures to reduce consumption, the allocation of available supplies, and action in respect of prices should be co-ordinated at Community level.
4. *Community-level organization of the market.* Three elements are required in order to achieve a smoothly functioning market for crude oil and oil products: information, co-operation action.

*Information.* This is an essential pre-requisite for ensuring 'transparency' in market operations. In an initial stage it will only be necessary for the information procedure to cover Community imports and exports, proposed investments by undertakings, and the costs and prices of petroleum products. An information system already exists for imports and investments (Council Regulation Nos. 1055 and 1056 of 18th May 1972 (3)).

The system could be expanded to cover imports by extending Regulation No. 1055 to petroleum products. A proposal on this subject and a proposal concerning exports have already been submitted to the Council.

Where the costs and prices of oil are concerned, the Commission suggests that detailed and regular information should be communicated covering costs and prices (cif and fob) of imported crude oil and petroleum products, and refining and distribution costs in each of the Member States.

*Co-operation.* Active consultation and co-operation between Governments, the Commission, and the oil companies is fundamental to ensuring the free circulation of oil and oil products within the Community and conditions which protect the interests of consumers. At this stage it appears possible to operate within a flexible voluntary system, without recourse to any rigid legal framework. The co-operation and consultation involved will take place within the framework of the Energy Committee and will cover all questions of supply and the activities of the oil industry.

*Action.* The Community means of action proposed by the Commission are few in number. It is not the Commission's aim to make the functioning of the market too rigid, which might happen if there were excessive and rigid regulations. The Commission is proposing three courses of action, the first of which is already operative, namely Community provisions on industrial competition and mergers. The second deals with commercial policy and the Commission is proposing that hydrocarbon imports and exports be subject to a joint inspection scheme (covering all licenses granted). From a statistical point of view, this system would be valuable and, in times of crisis, would make easier to adapt to a changing situation. The third course of action, which ought to be applied in stages, deals with the prices of oil products, whose levels should be aligned. After prior consultation between the Member States and the Commission, on any price alterations, there should be a gradual harmonisation of the criteria for price-fixing, such that, in the end, there would be a Community system based on transparency and the publishing of the prices, which firms had been free to fix. The national and Community authorities would intervene only if speculative market pressures developed or to prevent Community energy policy objectives from being jeopardised.

#### E. *The costs of the new energy strategy*

The cost of the proposed policy must not be compared to the pre-oil crisis situation. In the absence of any Community strategy, the market reaction to higher oil prices

- (1) Directives Nos. 68/414/EEC (OJ No. L 038, 23 December 1968) and 72/425/EEC (OJ No. L 291, 28 December 1972).
- (2) Directive No. 73/238/EEC (OJ No. L 228, 16 August 1973).
- (3) OJ No. L 120, 25 May 1972.

would have reduced growth in the consumption of oil and energy below the pre-crisis forecasts for 1985. The cost of the proposed strategy is thus the additional cost required to achieve the further reduction, below the level of the market reaction, in oil and energy consumption growth which is implied by the policy objectives.

On this basis the new strategy would require a net additional *investment* of about 10,000 million dollars (at 1973 rates) for the period of 1975/85. On the other hand, it would mean a *net saving* of about 50,000 million dollars (1973 rates) in *overseas payments* for the same period.

From a macro-economic point of view, therefore, the new strategy—far from increasing the cost of supplies—would progressively reduce it. This would be in addition to the increased *security* of supplies achieved.

To attain the necessary level of investment a prices policy would be needed to guarantee investors long-term profitability and security. This policy might be accompanied by incentive devices to speed up investment, and by fiscal measures to prevent undue financial benefits from accruing in respect of energy sources which have a low initial cost. A charge on the budget would arise only if the Member States or the Community had themselves to take action to moderate or encourage spontaneous developments.

#### F. Conclusions

In order to attain the proposed objectives by 1985 at the latest, a meaningful supply policy will therefore have to be pursued for each source of energy, comprising the appropriate incentive or disincentive measures in the administrative and financial fields both at the national and the Community level. Support to implement the new strategy could come from a Community agency having a legal personality and financial autonomy. It would be under the control of the Commission and would be assisted by a consultative Committee composed of representatives of the Member States and industry, workers and consumers.

If the Council adopts this new energy policy strategy, the Community would have a well-defined framework, into which would fit national policies and any future concrete proposals by the Commission on measures to be taken (1). The Commission would stress the need for the rapid implementation of the proposed Community policy to prevent any new energy crisis in the future from jeopardising the prospects for the Community's revival and survival.

- (1) Some of the measures proposed in the Commission document are already before the Council; others will be forwarded together with the strategy document. These are:
  1. Proposal for a Council Directive to restrict the use of natural gas in power stations;
  2. Proposal for a Council Directive to restrict the use of petroleum products in power stations;
  3. Proposal for a Council Regulation to establish an import and export system for hydrocarbons;
  4. Communication to the Council on the rational use of energy.

## A Summary of the Objectives of an Energy Supply Policy for the Community in 1985

### Energy demand

1 To reduce estimated consumption in 1985 by 10 per cent in relation to the amount initially estimated for 1985 by the more efficient use of energy.

2 In step with the development of nuclear energy, to increase the consumption of electricity, which should in 1985 represent 35 per cent of energy consumption (25 per cent in 1972).

### Energy supply

1) To limit to 40 per cent (63 per cent in 1973) in 1985 the degree of Community dependence for energy on outside sources.

#### 2) Oil

To limit to 40 per cent (60 per cent in 1973) the share of oil in the overall energy supply.

To limit to 75 per cent (98 per cent in 1973) the degree of dependence on outside sources for oil supplies. This implies production of 180 mtoe in the Community. To shift the emphasis of demand as a result, in particular by reducing consumption of heavy fuel oil in power stations.

#### 3) Solid fuels

At least to maintain the *absolute level* of current production of solid fuels (285 mtce/200 mill. toe in 1973 to 305 mtce/215 mill. toe in 1985; of this coal will remain at 255 mtce/180 mill. toe, in each case lignite production will supply the residue); and to increase imports (40 mtce/28 mill. toe in 1973 to 50 mtce/35 mtoe in 1985). The aim is to produce a share of solid fuels in the overall energy supply at a level of more than 15 per cent (about 23 per cent in 1973).

To shift demand in power stations as often as possible towards coal, and, at a minimum, wherever nuclear energy cannot be used (i.e. using coal to replace oil and natural gas in power generation).

#### 4) Natural gas

To make extensive use of this source of energy, the share of which in the overall supply should increase from about 2 per cent in 1973 to 25 per cent in 1985.

This will entail:

- (i) at least doubling Community production (115 mtoe in 1973);
- (ii) for the most part, using imports from a diversity of origins.

In respect of demand, the use of natural gas in thermal power stations—and perhaps in certain industries—should be discouraged.

#### 5) Nuclear energy

To ensure coverage of 50 per cent of electricity needs in 1985 by nuclear energy. This implies an installed capacity of at least 200 GWe for electricity production (+20 GWe for other uses).

## NATIONAL SOCIETY FOR CLEAN AIR

## ANNUAL GENERAL MEETING



The Society's Annual General Meeting was held on Wednesday, 3rd July, at the Connaught Rooms, Great Queen Street, London. The meeting was well attended, with members of the press and general public included in the audience of both the business meeting and the public meeting which followed.

After Dr. W. C. Turner, the Honorary Treasurer, had presented the Financial Statement for the year ending 31st March, 1974, and reported that the Society had had a good year financially, the Chairman of the Council, Mr. Wilfred Combey, presented the Annual Report. Mr. Combey considered that the Society had had an interesting year, but, because of reorganisation of the Society and of local government, not an easy one. There had been very successful conferences and seminars held by the Society during the year, but it was clear that a lot more work would have to be done by the Divisions to re-establish the Society locally.

Mr. Combey considered that education was an extremely important matter and although the Society was already doing not inconsiderable work in this field, there was a need for this to be continued and stepped up. Mr. Combey then offered his congratulations to Miss George on the award of the C.B.E. and Mr. Clancey on the award of the O.B.E. in the recent Birthday Honours.

The Chairman reported that the President of the Society, Mr. H. B. Greenborough, had been re-elected for a further year of office, and that Mr. R. A. W. Hollingdale would succeed Dr. Turner in the office of Honorary Treasurer. Mr. Combey then thanked Dr. Turner for all his work in the past and Miss George moved a vote of thanks and wished Dr. Turner well in the future.

The business meeting was followed by a public address given by Sir Brian Flowers, F.R.S., who spoke on the work of the Royal Commission on Environmental Pollution, of which he is Chairman. The address is reproduced in full later in this journal.

#### Chairman of the Council

Mr. Wilfred Combey has been succeeded as Chairman of the Council by Miss Mary George, C.B.E., B.A., Companion I.E.E.

Miss George has had a long career with the Society and has been a member of the Council since 1958. In 1960 she became Chairman of the Publicity Committee, a position she held until 1971, at which time the Publicity Committee combined with the Conference Committee to become the Conference and Publicity Committee. From 1971-74 Miss George was Deputy Chairman of the Council and from 1973-74 Chairman of the General Purposes and Finance Committee.

Miss George succeeded the late Dame Caroline Haslett in the post of Director and Secretary of the Electrical Association for Women in November 1956.

She was born in Peterborough but spent most of her early life until leaving school in Dover; she is a graduate in English of London University. She worked for a time in the Privy Purse Office at Buckingham Palace and then in publishing. She joined the civil service during the war and became Principal Information Officer in the Ministry of Agriculture, Fisheries and Food where she was concerned with all aspects of the Ministry's press and public relations work and with food and nutritional education.

Miss George was appointed in October 1973, Chairman of the Consumer Standards Advisory Committee of the British Standards Institution and in March 1974 a member of the South Eastern Electricity Consultative Council.

She was elected a Companion I.E.E. in 1966.

Her principal social work is as Chairman of a Housing Association in London which provides flatlets for needy, older women.

Miss George has, in her private capacity, written articles and plays. She enjoys gardening, cooking, the theatre, travel and painting in her spare time.

She received the C.B.E. in the Birthday Honours List 1974.

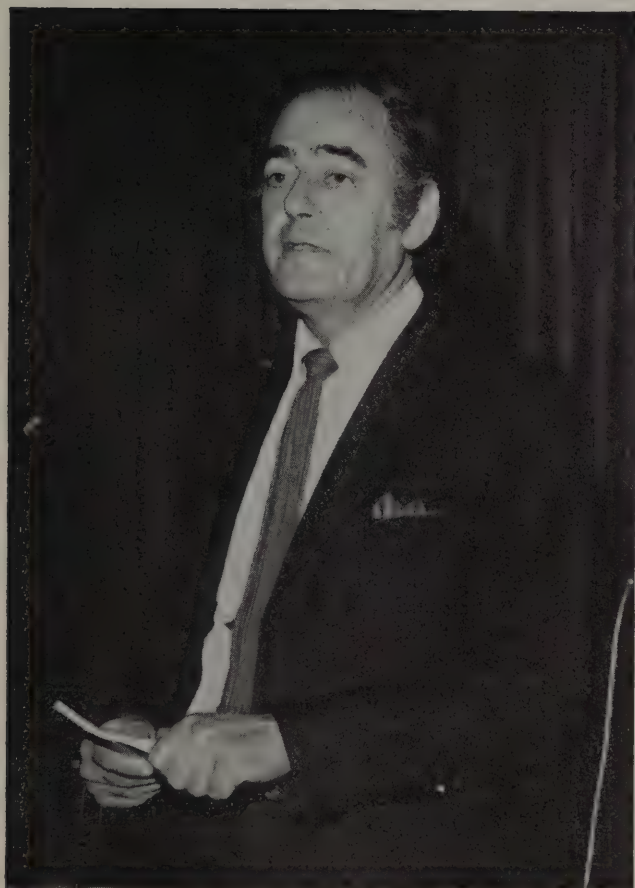
We are extremely grateful to Mr. Combey for all his work as Chairman during the past difficult year. In the time at his disposal Mr. Combey has managed to visit most of the divisions, for which we are very grateful.

# PUBLIC MEETING

Wednesday, 3rd July, 1974

Address by Sir Brian Flowers, FRS, Chairman of the  
Royal Commission on Environmental Pollution and Rector of  
Imperial College

The Work of the Royal Commission on Environmental  
Pollution



I am very grateful for this opportunity to speak to you about environmental pollution, and especially about how the Royal Commission sees its responsibilities in that very wide field. The Commission, perhaps I should remind you, is a *standing* body originally appointed in February 1970 under the chairmanship of Lord Ashby. All the original members have by now retired, and I would therefore like on this earliest of public occasions to express my thanks, and indeed admiration, to Lord Ashby and his colleagues for all that they have done. They have brought about a more sober public awareness of the problems of pollution, and they have been the moving spirit behind so much sensible and helpful legislation directed towards better control. I believe the country owes them a considerable debt.

In the course of their work the founder members produced three reports. The first was a general survey of the whole field of pollution and a statement of how the

Commission then saw its responsibilities; the second, a brief document drawing attention to three specific matters (the confidentiality of information about industrial wastes, the impact of new products on the environment, and the disposal of toxic wastes on land); and the third, a major report on the pollution of estuaries. Almost as important as these documents, however, was the fact that the Commission kept in close touch with Government over the whole field of pollution control and was thereby able to assist the legislative process merely by drawing attention to problems large and small which seemed to it to merit further attention. In turn, it was consulted about many matters by the Government. This continual two-way exchange of views was a vital aspect of their work, as it remains of ours today.

The earlier work can be said to have been mainly concerned with gross chemical pollution—the effects of introducing large amounts of polluting substances into air, land or water, such as smoke, persistent pesticides or untreated sewage—and with the legislation and codes of practice needed to bring such matters under control. ‘Straightforward physical pollution’, our former colleagues called it; and it is with straightforward physical pollution that we shall still mainly have to concern ourselves in the future. For although legislation like the Control of Pollution Bill (which I hope will soon be on the Statute Book) represents a huge step forward, we shall have to monitor how this legislation works in practice: whether it is used with sufficient vigour, how successful it is in dealing with the classical pollution problems, where the economic burdens fall, how adaptable it is in limiting the effects of new substances and processes, and whether administrative arrangements at national, regional and local level are adequate to serve its purposes smoothly and without undue complication.

One of our difficulties here (although we welcome it!) is that there are other bodies active in almost every field of pollution, whether official committees like the Clean Air Council, or highly reputable private bodies like the National Society for Clean Air. There are also a number of less reputable though, no doubt, well-intentioned bodies and individuals to contend with, some of whom command a formidable share of public attention!

Our greatest difficulty, however, is to choose from the vast field of environmental pollution—and I must emphasize that in our terms of reference neither of these words is in any way defined!—those matters which should occupy most of our attention and limited resources. We try to identify areas calling for fresh and independent enquiry, not necessarily those causing the most public concern and not necessarily those receiving least official

attention. We regard it as important to inform the public as well as the Government of our views: to try to dispel public concern when we are convinced it is unjustified, or at least exaggerated; but on the other hand to draw attention to problems of which we believe the public should be more aware. Our terms of reference require us to advise, in particular on the adequacy of research in the pollution field and on future possibilities of damage to the environment.

We have given some thought, however, to the question how far we should concern ourselves with matters that would normally be classified as nuisances rather than hazards and where the appropriate measures are necessarily more subjective. Noise and land dereliction are of this kind, although it may be disputed semantically whether either can properly be classified as a pollutant. Few would deny that noise, one of the worst environmental afflictions of modern society is within our remit. But even though noise may be more immediately distressing than visual ugliness we believe that dereliction is equally unacceptable to those badly affected by it. Moreover, the incentive to remedy dereliction will often depend upon reducing other forms of pollution. For example, improvement of a grossly polluted river will foster the will to deal with squalor and decay on its banks. Environmental improvement calls for an integrated approach: a beach freed of oil but ankle deep in litter is still a grossly polluted beach. From arguments like this we have concluded that it would be wrong to exclude nuisances from our field of enquiry.

The last few years have seen much debate about global problems arising from the growth of technological activity. Industrial and population growth, with their concomitant problems of pollution, food production, consumption of non-renewable materials and energy supplies, are seen by some as leading inexorably to crisis. Some even proclaim (as some people have always proclaimed) that the hour of doom is nigh—or at least can only be averted by fundamental changes in the structure and values of society, by the abandonment of economic growth, or even by reversion to some form of pre-industrial community (although it is usually only other people's comforts they are prepared to give up). Others see no limit to man's resourcefulness, expressed through continuing technological development to solve these problems within a social and economic framework similar to those we already know. Although these vast issues lie outside our terms of reference we welcome the studies that are going on to shed light on global problems and their future implications for mankind. But we urge caution in drawing conclusions from what are necessarily at this stage greatly oversimplified models of the real world. Dire predictions that can be shown to rest on unsubstantiated data and inadequate analysis do not help, and indeed can positively harm, the environmental cause. Generation of public hysteria is a dangerous weapon: it is apt to back-lash and result in contemptuous indifference instead. It is particularly dangerous when its authors are those, like scientists, upon whom society relies for a dispassionate and objective assessment of complex evidence. We must not cry 'Wolf'!

Although the Royal Commission does not accept that pollution will necessarily set a limit to economic growth, we are directed by our terms of reference to advise on future possibilities of damage to the environment through pollution. Ways in which continuing pollution might lead to long term environmental crisis should therefore be high on our agenda. Certainly we can no longer discount the possibility of adverse global effects. There has, for

example, already been serious concern about the effects of waste products on a large water mass like the Baltic Sea which a century ago would have been seen as an inexhaustible sink for pollutants. A good deal of thought has likewise been given to the long term effects which could follow the large amounts of carbon dioxide released into the atmosphere by the continuing combustion of fossil fuels. But we are not yet able to predict reliably how the CO<sub>2</sub> produced during the next century will affect our weather or, following absorption from the atmosphere, the processes going on in our seas. This is not just because we do not know at what rate the world's fossil fuels will be burnt, but also because there is insufficient understanding of the chemistry, physics and biology of the world over such a long time-scale. These are matters that we intend to consider and on which we can be expected to urge that Britain continues to play her full and distinguished role in international research and assessment.

A recent development with important implications for the environment is the greatly increased cost of oil. This is leading to fundamental reappraisals of energy production and utilization. Nearly all energy conversion leads to pollution, but a different pattern of energy conversion implies changes in the resulting pattern of pollution. A change from coal to nuclear energy, for example, could lead to a reduction in sulphur dioxide emissions, and also in land dereliction due to coal mining, but to an increase in extremely toxic radioactive wastes. Of course, it is to be hoped that the changing economics of energy supplies may bring overall environmental benefit by encouraging a less wasteful use of energy. Nevertheless, we consider it important that the environmental consequences of the exploitation of new energy sources be fully explored and that the changing patterns of pollution be kept under continual review. You will not be surprised, therefore, that we have already announced our intention to undertake a formal enquiry into radiological hazards, its main emphasis being on the problems that might arise in the future with respect to the storage and disposal of radioactive wastes from nuclear power stations, the transport of nuclear materials, and the siting of nuclear installations. We are also making some preliminary enquiries about the nature and scale of environmental hazards associated with off-shore oil exploitation with a view to deciding whether there is a case for more searching investigations.

The world-wide nature of environmental problems is reflected in the growing scale of international collaboration. Indeed, there is a bewildering array of international bodies concerned with various aspects of the environment. Our membership of the European Economic Community has already begun seriously to impinge upon pollution control in this country. We are bound by several directives from Brussels, two concerned with biodegradability of detergents (that just means that they should rot!) and three with noise and gaseous emissions from motor vehicles; several others are under consideration ranging from the disposal of waste lubricating oil to quality requirements for drinking water.

Wider than Europe's, however, are the considerations of the United Nations Environment Programme, especially those put forward and adopted at the Stockholm Conference in 1972 and in Nairobi last March. Those of particular importance to us at present concern an internationally co-ordinated network of monitoring systems to survey environmental trends, an international referral service and the co-ordination of data banks on toxic

chemicals and similar projects. These are important developments, for in the long run it is only by concerted action throughout the world based on common knowledge that many of the major environmental problems can be resolved.

The largely new membership appointed to the Royal Commission last year decided to begin its work, as its predecessors had done, by conducting a review of the whole field of pollution, including all the aspects I have already mentioned. In some cases we called for informal evidence and visited laboratories. The main purpose, however, was to make some contact with every aspect of the problem in order to come to a decision about our own priorities for work. We also believed it would be useful to bring up to date the earlier survey of the First Report, and eventually to publish it as we hope to do shortly. I shall refer briefly to a few of the topics we have considered.

Firstly we took note of the 1973 Report of the Population Panel set up to assess the significance of population growth—especially since the Panel had not considered the effects on pollution because of the existence of ourselves. Clearly we could not ignore population growth because of the existence of the Panel! A Minister has been appointed with responsibility for population matters, a campaign to increase public awareness of population problems is to start later this year, and family planning has been incorporated in the National Health Service.

The Panel found that a moderate increase in the population of the United Kingdom—about 300,000 a year—seemed probable over the next few decades. This is not of itself alarming, but because of increasing demands per head for energy, water and materials, waste products may increase at a faster rate. The capacity of the environment to absorb waste, however, is in some respects unalterable; fresh water and land are two obvious limitations in our densely populated country. Indeed, this is already emphasized by the recent rise in nitrate concentrations in some rivers, especially those near London—a phenomenon typical of the sort of pollution problem ultimately associated with the rapid rise of population in certain regions. Moreover, in these conditions land that was previously undeveloped, perhaps because of noise or smell from local industry, becomes needed for additional housing and there is then a planning problem. The root cause of the trouble, however, is the growth of population at least at the local level. We concluded that although the increase in pollution that will accompany the predicted increase in population should have little or no effect on health, it will have a substantial effect on amenity. This is not of itself sufficient reason to attempt to modify the birth rate, but it adds force to the argument that a more stable population pattern would be a wise national goal.

Much faster than the growth of population, however, is the growth of motor vehicles. Since this was commented upon in the First Report the Warren Spring Laboratory have started a five-year programme of monitoring of airborne pollutants from traffic. Sampling sites are being set up in Birmingham, Cambridge, Cardiff, Glasgow and London and the results will be published as they become available.

In the United States new cars are required to be fitted with devices to control the emission of unburnt hydrocarbons and oxides of nitrogen. In bright sunshine and

still air conditions, these may combine chemically to produce ozone and organic peroxides which lead to the so-called "photochemical smogs" of Los Angeles and elsewhere. They are frequent—on 3 days out of 4 in that city the ozone concentration exceeds that at which eye and throat irritation becomes commonplace. We are not so far from these conditions here. However, although recent monitoring has shown that this concentration was exceeded in London on 30 days last year, no reports have yet occurred of widespread eye irritation.

Among other vehicle emissions are carbon monoxide and lead. The latter I will mention later. Measurements of CO made by the GLC in 1971 and 1972 show that in some busy streets the mean levels during the working day may induce a blood carboxyhaemoglobin level sufficient to be considered undesirable for cardiovascular patients. However, it is now well known that such levels have little observable effect on healthy people, and are frequently exceeded by quite moderate cigarette smokers. Clearly, those who complain about CO poisoning on our streets will carry little conviction if they smoke cigarettes!

An area that demands an integrated approach is that of waste disposal. Most solid waste comes from the mining and extraction industries, and those concerned are making increasing efforts to dispose of it usefully. This is trebly beneficial as it reduces local accumulations which are unsightly and sometimes dangerous, decreases our dependence on primary extraction which frequently leaves dereliction in its wake, and makes available for other use land at present covered with spoil. The major problem is nearly always the economics of transporting an essentially low-grade commodity. If large-scale movements are to be undertaken all three parties (the seller, the carrier and the user) must derive some net benefit from the transaction, and this may well not be possible unless amenity-value to the community can also be taken into account. Even so, if the waste materials concerned do not comply with the appropriate standards there may be justified reluctance to use them for construction purposes.

The disposal of toxic materials raises quite different problems. In its Second Report the Royal Commission drew attention to the need for stricter control over the means of disposal, and the Deposit of Poisonous Wastes Act passed in 1972 requires industrial companies to notify the local authority of any noxious waste requiring disposal. Moreover, when the Control of Pollution Bill becomes law, all land tips will have to be licensed. Local authorities will be required to make a plan for waste disposal, including estimates of all dangerous wastes likely to be generated in their area. Both the authorities and the firms can seek expert advice—for example, from the Hazardous Materials Service which has been operating at Harwell since 1970. This all represents a considerable advance, and in the meantime a number of dangerous tips have been closed. However, there is still a lot of uncertainty about the amount of waste being produced, especially that discharged to estuaries, and about its composition. Most of these wastes are disposed of by land-fill, but further restrictions on tipping will encourage the expansion of the chemical waste processing industry. There, again, an element of integration is called for because the decision to site a treatment plant in a particular area will sometimes arouse intense local opposition on environmental grounds. In the absence of a national plan drawn up in consultation with local authorities there is a danger that the location of treatment plants may be based on short-term and parochial considerations.

There are many other things that could be said about waste materials, but before leaving the subject I want only to refer to the problem of litter. When I was sounding out Government Departments about what they considered it important for us to put our minds to, I was very strongly advised by senior officials not to concern ourselves with litter because it was beneath the dignity of a Royal Commission. I concluded that perhaps that was why we were such a litter-dropping nation, and I resolved to be undignified.

Of course, litter cannot be regarded as an environmental hazard in the way that many pollutants can—although it would be a mistake to suppose that it can never be dangerous. But it is a disfigurement and a nuisance, and costs £25 million to clear up. Possibly it should cost a great deal more; possibly the fact that it does not, indicates that the British people, through their own individual actions and the attitudes of their elected representatives, are not particularly conscious of environmental degradation even in its most obvious form. However, a poll of public opinion sponsored by the Keep Britain Tidy Group in 1972 revealed that those questioned selected litter in public places far more often than they did dirty rivers and beaches or foul air as the most unpleasant form of pollution. Nevertheless, despite legislation and increased penalties, and national and regional campaigns, the problem persists. Perhaps the police and the courts also regard litter prevention as an undignified pursuit; perhaps that is why only 2,179 persons in England and Wales were fined in 1972 for offences under the Litter Acts as compared with over 2 million fined for parking offences, and that in over 80 per cent of the cases the fine did not exceed £10 although the law allows for a maximum penalty of £100. If a major improvement in the habits of the litter-dropping public is to be effected it may be helpful to study how such a change was achieved in Singapore, where both education and rigorous law enforcement have transformed the city into one of the cleanest in the world.

I cannot omit from this brief account some mention of water pollution. Since the First Report, the survey of the state of cleanliness of inland rivers has been updated twice. Rivers are classified chemically as unpolluted, doubtful, poor and grossly polluted, and are tabulated by mileage. All stretches of rivers with a summer flow of at least a million gallons a day are included: in effect this means that most rivers are included to within a few miles of their source. On this basis about 80 per cent of rivers are poor or grossly polluted. The figures show that, overall, advances are being made in the quality of rivers, but even so, for every seven miles improved one mile has deteriorated. However, more mileage is not necessarily the most appropriate measure of the problem because it is often in the lower reaches of rivers, with their large flows, that the worst pollution occurs. One million gallons per day is, after all, a trickle that provides little by way of amenity or utility; by comparison even that delightful little stream, the Cam, has a mean summer flow at Cambridge of 30 million gallons a day. It is important to use measures correctly reflecting the nature of the problem. (A similar difficulty, incidentally, occurs in trying to see what is happening about derelict land; it all depends on the measure used.)

A recent report by the Water Resources Board has estimated that, by the turn of the century, a further 10 million cubic metres of water per day will be needed for public water supply. There is no absolute shortage, rather a problem of distribution from the wetter regions

in the west to the drier regions in the east. The Board believes that if the quality of some rivers (notably the Trent) were improved sufficiently they could make a substantial contribution to water resources. The purity of rivers should be improved to the point where they can themselves carry water suitable for public supply to the points of heavy demand in their lower reaches. This would avoid the need for abstraction high upstream with the heavy building and maintenance costs of lengthy pipe lines and even of reservoirs. As for those rivers required for public enjoyment, the social and amenity benefits of improvement will again only be fully realised by an integrated upgrading of several aspects of the physical environment.

A problem of particular interest at the present time—because we do not fully understand it—concerns the nitrate concentrations to which I have already referred and on which there has been recent newspaper publicity. They occur in rivers mainly because of the natural run-off from agricultural land, and they are a normal component of a well-regulated sewage works effluent. However, concentrations in some rivers in the South East have risen steeply during the last three years, and this has forced water authorities into measures to reduce concentrations to acceptable levels in supplies. High nitrate levels constitute danger to bottle-fed infants, and there is also evidence that certain carcinogenic substances can result from the action of bacteria on nitrates, although whether this is a real risk to man remains to be seen. The immediate causes of the high nitrate levels are the succession of mild winters which prevent nitrates from being broken down in the soil, and lack of rainfall to dilute the flow from sewage works. A start has been made to reduce the nitrate content of sewage effluent; but the nitrogen balance of rivers is not well understood, for the estimated total load from all sources far exceeds the amount observed. There is therefore need for more research into naturally occurring denitrification before large sums are spent on particular technological solutions.

Water research and development is a matter to which we shall devote special attention through our Research Sub-Committee which acts as an advisory council to the Department of the Environment. We are giving the new Water Authority a chance to settle down, however, before launching any major enquiries upon them.

Finally, I would like to mention the problem of atmospheric lead which has caused a lot of recent public anxiety. Lead has always been widespread in soil and water; it is absorbed by plants and animals and is a natural constituent of the body. It has no known biological function in man, however, and unlike many other substances there is no evidence of regulatory mechanisms for maintaining the amount of lead in the body at an optimum level. Hence the body burden is directly dependent on the amount absorbed. Most cases of actual poisoning have arisen amongst those exposed to lead at work, but it has also been well known amongst people who habitually drank soft water allowed to stand overnight in lead pipes, and used to be prevalent amongst children who persistently chewed toys coated in high-lead paint.

All this is now well understood and mostly under control. However, there is always the possibility that lesser concentrations of lead could undermine health in a more subtle way, and that vehicle exhausts might contribute to such effects, as might dust around lead works also. There is some conflict of medical opinion here,

due partly to the absence of consistently gathered data and partly to the inherent difficulties of looking for the long-term effects of very small quantities of pollutant—a matter by no means confined to lead, incidentally. However, there is general agreement that there is no immediate cause for alarm. The greater part of the lead content of the body is due to the ingestion of lead with food, and the amount of blood lead is not much higher in townsmen than in countrymen. One effect has been demonstrated, namely the partial inhibition of an enzyme involved in the formation of haemoglobin, but this has not been correlated with any known disease. There is, in particular, and contrary to initial fears, no relationship between blood level and general intelligence, reading ability, or behavioural disorder amongst children living near lead works. In reporting this to you I am well aware that I shall not hit the headlines: reassurance is not news!

More research is needed to establish the extent to which lead from motor exhausts gets into the body and whether it does any harm in such small amounts. The removal of all lead from petrol or at least from the exhaust is technically feasible, but it should be remembered that the result would be to modify the other combustion products and this might in the end prove more harmful. In the meantime, however, there seems no need for emergency action.

I am painfully conscious that in this address I have left unsaid more things than I have said, and have dealt quite inadequately even with the matters I have chosen to mention. The field of environmental pollution is indeed a wide one. Moreover, I have made no startling revelations, no fresh analyses. I have tried to give you some idea of the scope of our work in the hope that even that might interest you. I have tried to convey the impression that there need be no crisis, that pollution can be brought under control by better legislation, by a more integrated and balanced approach, by economic incentives, by changes in individual and public attitudes, and sometimes by improved fundamental knowledge.

You may feel, however, that I have been deliberately perverse before such an audience in paying so little attention to air pollution. There are two reasons for that. The first is that it is what concerns your Society full-time and I thought you might like a bit of a change. The more important is that the Secretary of State for the Environment has just asked the Royal Commission to undertake a study “to review the efficacy of the methods of control of air pollution from domestic and industrial sources, to consider the relationship between the relevant authorities and to make recommendations”. We have gladly accepted his invitation, although fully aware of the difficult and possibly thorny terrain we

shall have to traverse. We shall perforce be concerned with the manner in which the Alkali Inspectorate goes about its important functions, with the scope of its purview, and the extent of its success, with the famous concept of “best practicable means” and whether and in what circumstances it is superior to statutory controls, with the economic burdens placed upon industry by the demand that there shall be cleaner air, with the desirable relationship between central control and local initiative, with the right of the public to know to what extent they are being polluted and by whom, and a host of other matters. There are also unresolved scientific issues such as the effects of air pollutants, especially  $\text{SO}_2$  on vegetation, identified by one Government study as probably the largest single cost attributable to air pollution. Our study is only about to begin: it seemed to me impossible to say anything useful at this stage that would not seem prejudicial to what has to be done during the twelve months we have agreed shall be allotted to our study. In these circumstances I beg to be excused today, although we shall welcome any evidence the National Society for Clean Air cares to give us.

But one thing I would like to make clear to you concerning how the Royal Commission sees itself: I have made the same point before when describing our study of radiological hazards to the British Institute of Radiology. It is that the Royal Commission is essentially a lay body. Whereas each of its members may be expert in something or other from chemical engineering to local affairs, it is not intended as a body to be expert in any particular topic. What it can do is to bring a very considerable weight of diverse experience to bear on any question it undertakes to study: wider indeed than that of the members who served Lord Ashby, for its membership is now drawn more broadly. But we are not able to repeat all the measurements and recalculate all the resulting assessments! All we can do is to hold discussions with the people most closely concerned with making assessments of hazards and of nuisances, with those most immediately responsible for designing and operating suitable safeguards, with those primarily affected both by pollution and by the counter-measures, and to see something of the corresponding organisations at work and of the results they have been able to achieve; and hopefully thereafter to pronounce ourselves satisfied with the arrangements as a body of reasonably intelligent, independent but experienced laymen, well able to report dispassionately to the public. But if we are not satisfied in any respect whatever we shall not hesitate to say so, and to make appropriate recommendations to the Government which we may hope to see embodied in future legislation, codes of practice and organisation. That is how we see our duty, and it is the attitude we shall adopt during our enquiry into the control of air pollution.

## CARDIFF



*Civic Centre, Cardiff*

**THE NATIONAL SOCIETY FOR CLEAN AIR**  
**41st ANNUAL CONFERENCE**  
**CARDIFF**  
**14th-18th October, 1974**

In some ways the decision to hold the 1974 Clean Air Conference in Cardiff may be regarded as a departure from tradition in that Cardiff is not usually regarded as a resort. Nevertheless, though not a resort, Cardiff has its seaside and it is the capital city of Wales.

It is a city that spreads fan-like from the docks, which were responsible for its rapid, booming growth in the great coal-exporting days of the 19th and early 20th centuries. The city centre is compact and is well stocked with both local and national shops and stores. Much of the area lying behind the main shopping thoroughfares is due for demolition under a multi-million pound central area redevelopment scheme, but while the buildings are plainly elderly there will be many people who will regret their disappearance, with their character and their association with Cardiff's past.

The beauty of the Civic Centre is one of the hallmarks of the city, and another is its plentiful and spacious parkland. There is plenty to do and plenty to see both in Cardiff and in the near vicinity. History is catered for by the National Museum, the Castle, Llandaff Cathedral or the nearby Welsh Folk Museum at St. Fagans.

Cardiff could be, in a sense, a throwback to the days of long ago when a number of small villages stood where many of the districts of today stand. They clung loosely round the three rivers which pierce the city—the Ely, the Taff and the Rhymney. The Taff is the most well-known of them—a broad river which passes through urban and park areas in Cardiff before it enters the Bristol Channel at the entrance to the docks.

The river has its source in the mountains of the Brecon Beacons National Parkland, and much has been done in

recent years to limit pollution as it flows through the Taff Valley to the sea.

Colonised by the Romans, raided by the Danes and later conquered by the Normans, Cardiff received its first Royal Charter from Queen Elizabeth in 1581.

By the early 16th century, Cardiff had become a reasonably busy port. What really set the scene for a hundred years of amazing expansion was the building of a canal from Aberycynon to Cardiff between 1792 and 1794.

Industrialists were out to move their iron—and later their coal—quickly and cheaply. Cardiff's situation offered the ideal outlet, and its future as a major port was secured. The first dock was dug in 1839; the first railway between 1845 and 1850. After that, nothing could hold Cardiff back as industry began to boom, trade to flourish. In the period after 1850 Cardiff grew from a small river harbour of local importance to a position as a world port. The export of coal increased at a dizzy pace—from two million tons in 1861, to ten and a half million tons in the peak year of 1913. It also became the main centre in South Wales for the import and milling of grain, and side by side with these developments, the population grew. In 1801 there was just 1870 people in Cardiff—but by 1931 the figure had risen to 226,937. In 1905 Edward VII made it a city—and in 1955 Queen Elizabeth II declared it to be the capital of Wales.

Now the tide of trade has turned, the first dock was closed in 1964, and new industries have grown up. The boundaries of Cardiff have been increased and it is now the focal point for the new administrative area of South Glamorgan.

#### **Opening Session—Monday 14th October. The City Hall.**

20.30 The Conference will be opened by the Right Worshipful the Lord Mayor of Cardiff Councillor A. Huish, J.P. The President will deliver the annual address.

#### **Session Two—Tuesday 15th October. The New Theatre.**

a.m. New Legislation (The Local Government Act, The Protection of the Environment Bill, The Water Act, 1973, etc.) and its implications and effects on Local Authorities, Regional Water Authorities, etc. W. Bate, M.B.E. (*Chief Public Health Inspector, Cardiff*).

#### **Session Three—Tuesday 15th October. The New Theatre.**

p.m. Environmental Pollution: The Technical Aspects of Co-operation between Industry and the Local Authority—Dr. Roland Jenkins (*B.P. Chemicals International Ltd., Port Talbot*).

#### **Session Four—Wednesday 16th October. The New Theatre.**

a.m. Environmental Pollution: Road Traffic.  
(a) Noise—T. W. Heppell (*Building Research Establishment, D.O.E.*).  
(b) Preliminary Findings of the Five Towns Survey—Dr. R. G. Derwent and Dr. H. N. Stewart (*Warren Spring Laboratory, D.T.I.*).

#### **Session Five—Thursday 17th October. The New Theatre.**

a.m. The Prevention of Pollution from Industry.  
(a) The Coal Industry—Mr. David Broadbent (*National Coal Board*).  
(b) The Steel Industry—Dr. A. O'Connor (*British Steel Corporation*).

#### **Open Session—Thursday 17th October. The New Theatre.**

p.m. Wild Life and the Effects of Pollution—Dr. K. Mellanby, C.B.E. (*National Environmental Research Council, Monks Wood Experimental Station*).

#### **Session Seven—Friday 18th October. The New Theatre.**

a.m. The Measurement of Heavy Metals in the Atmosphere and their Interpretation.  
(a) Mr. N. J. Pattenden (*A.E.R.E., Harwell*).  
(b) Prof. G. T. Goodman, Dr. G. D. Parry, Mr. S. Smith and Mr. M. J. Inskip (*Chelsea College, University of London*).

Delegates Fee £25.00+V.A.T.

Full details and conference brochure available from:—  
136 North Street, Brighton, BN1 1RG. Telephone Brighton 26313

# National Society for Clean Air

136 North Street, Brighton BN1 1RG (Brighton 26313)

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W. E. Pollitt, Area Environmental Health Officer, 129 Chorley Road, Swinton, Manchester. (061-794 4711).

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### **SOUTH WALES and MONMOUTHSHIRE**

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## **SUBSCRIPTIONS**

*(The following is an extract from the current Bye-laws of the Society).*

2. Annual Subscriptions shall be as hereinafter provided. A first annual subscription shall be made on application for Membership and shall continue in force until the first day of April of the following year, when it shall be renewable.

#### (a) Individual Members

The annual subscription payable by an Individual Member shall be not less than Three Pounds. On attainment of the age of 65 on payment of a sum of Ten Pounds, Individual Members may, at the discretion of the Council retain their membership of the Society in perpetuity, but always subject to the Council's rights of removal.

#### (b) Student Members

The annual subscription payable by non-graduate students pursuing their studies at school, college or university shall be One Pound.

#### (c) Local Authority Members

The annual subscription payable by a Local Authority shall be not less than as follows. For Local Authorities with a population of:

Less than 100,000	£ 50.00
100,001 to 250,000	£ 60.00
250,001 to 500,000	£ 75.00
500,001 to 1,000,000	£100.00

For each additional 500,000 or part thereof £10.00

#### (d) Corporate Members and Unincorporated Bodies appointed in accordance with Article 4(e) (ii)

The annual subscription payable by Corporate Members and Unincorporated Bodies shall be not less than as follows:

(i) Small local civic societies, colleges, schools and similar organisations £5.00.

(ii) Regional and national societies and similar organisations, consultants and small industrial and commercial firms £30.00.

(iii) Industrial organisations £50.00.

#### (e) Sustaining Members

The annual subscription for Sustaining Members shall be not less than £100.00.

#### (f) Membership—Special Cases

The Council shall have power to elect any applicant for Membership to an appropriate grade of Membership, on such special terms as to subscription or otherwise as after considering any reasons for so doing stated by such applicant the Council may think proper.

National Society For Clean Air

# NEWS FROM THE DIVISIONS

## YORKSHIRE



*Roses being presented to Thornes House School, Wakefield.*

### Environmental Pollution Schools Project & Competition in Wakefield

The above photograph, showing the presentation and planting of roses at Thornes House School, Wakefield, by the then Deputy Mayor, marks the successful conclusion of a pilot scheme which was the 'brainchild' of Mr. W. F. J. Hannaford. In his capacity as Chairman of the Health Sub-Committee and by his service on the Education Committee he was able to engineer a joint educational programme and competition involving both the Education and Health Departments.

Six schools in the Wakefield area accepted an invitation to take part; project masters were appointed and teaching started in January 1974. The ways in which man polluted his environment were examined and measures which could be taken to detect, monitor and (hopefully) prevent pollution were considered.

While the teachers organised the inter-school knock-out competition, the Health Inspectors provided films, material and technical know-how.

All Committee members were invited to submit questions and answers for use in the Quiz, and from the mass of material which ensued a small Sub-Committee of teachers prepared questions which were suitable for both junior and senior teams. Some 'tie-breaker' questions were also included in case of deadlock.

The finals of both Junior and Senior Competitions were held on the same evening in March, in a school hall big enough to accommodate parents, friends and well-wishers. Mr. T. Roland-Jones from Bretton Hall College of Education acted as Question Master and 35 mm. colour slides were used as a basis for many of the questions. In the event an exciting needle match developed in an atmosphere of rising excitement and tension.

Prizes were given by the Solid Fuels Advisory Service of the National Coal Board. Individual book-tokens were presented to the finalists, and the two winning schools received beds of 'Living Fire' roses.

Useful experience was gained from the exercise and, given sufficient time and preparation, the Competition could be adapted for a larger number of schools. Organisation of the 'knock-out' would be done by the schools, and the Environmental Health Department would make available details of films, slides, posters and other material to allow schools to order for their own individual needs.

## SCOTLAND

The Burgh of Falkirk, which at one time was one of the "black areas" of Scotland, is presently undergoing a mammoth operation of environmental improvement. The operation is not restricted to smoke control, although this is certainly a very important aspect of it. At present there are ten Smoke Control Area Orders in force in the Burgh, and with a further Order being operational as from September, there will be only one small area of the Burgh not covered. It is expected that the making of an Order in respect of this area will be approved before the end of the year, and therefore the whole Burgh will be smoke-free by the middle of 1975.

The Burgh of Falkirk has on its doorstep the petrochemical complex and refinery at Grangemouth, and it would have been very easy for the Town Council to take the attitude that any action on their part to improve the environment would have been negated by the pollution from Grangemouth. However, the fact that they did not take this attitude and decided to press on with their scheme reflects great credit on the members and officials of the Town Council.

One side-effect of the scheme is that the residents of Falkirk will no longer be able to wish each other the age-old Scottish greeting "Lang may your lum reek".

## Scottish Clean Air Conference

The Annual Conference of the Scottish Division of the Society was held at St Andrews on the 30th and 31st May. The weather was kind and the old town of St Andrews was seen at its picturesque best. In the minds of many the name St Andrews is almost synonymous with golf, and it is often forgotten that St Andrews is well worth visiting for itself alone.

On the evening of Wednesday, the 29th May, the Scottish Division held its Annual General Meeting at which Mr. I. B. Anderson of Port Glasgow was elected President for the ensuing year. Following the meeting there was a social evening at the Star Hotel for all delegates.

The Conference proper started the following morning at the Town Hall, where delegates were welcomed by the Provost. The Conference was officially opened by the President of the Society, Mr. H. B. Greenborough, who set the keynote for the Conference with a very fine address on clean air and the uses of energy with particular regard to oil from the North Sea. A technical session then followed. Mr. B. J. Taylor presented a progress report on the Post Graduate Research Project on Air Pollution in West Central Scotland which had been sponsored by the Division. He was followed by Mr. A. W. C. Keddie who spoke about the Forth Modelling Study sponsored by the Scottish Development Department. After lunch, Professor G. Melvyn Howe, University of Strathclyde, and Mr. D. Hammerton, the Director of the River Clyde Purification Board, spoke on "Pollution". These two papers covered a very wide field and a very lively discussion followed. The next day, Mr. Ian Kirkwood of the Institute of Heating and

Ventilating Engineers presented a paper on "The Future of Home Heating," and this is reproduced in full later in this journal. Mr. T. D. Guthrie of the University of Dundee spoke on "Noise as an Air Pollutant". All the papers were very informative and some were extremely provocative; rather naturally this led to animated discussion. The Conference was attended by some 120 delegates, and all who were privileged to attend this Conference certainly learned something new and went away with a lot to think about. The Divisional Council of the Scottish Division are to be congratulated on arranging a programme with such wide coverage.

The social side was not neglected. On the Thursday evening the Provost and Magistrates of St. Andrews entertained delegates at a sherry party in the Town Hall; and on Friday, the Scottish Division were hosts at a luncheon held in the Star Hotel. The fact that St. Andrews is the home of golf was not forgotten. On the Friday afternoon the Solid Smokeless Fuels Federation very kindly organised a Stableford Golf Tournament on the Old Course. It was a glorious afternoon, but as is so often the case in that eastern corner of Fife, the wind blew strongly from the east, and all those who played found out how difficult the Old Course can be. Eighteen golfers took part in the competition, and the first off the tee were the President of the Society, and the President of the Scottish Division. The competition was won by Mr. E. Oates of Grangemouth, and the runner-up was Mr. L. A. Fotheringham. The golf might be said to have put the seal on what was a very successful and enjoyable Conference. The hope was expressed that the golf competition might become a permanent feature of future Scottish Conferences. It will be interesting to see what venue is chosen for next year's Conference. Gleneagles? Carnoustie? Troon?

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## South-East London Technical College

The approved one-year course for the Royal Society of Health Diploma in Air Pollution Control, conducted at the College for many years, has been re-arranged for the Academic Year 1974-5, to cover one day a week during the college session starting on September 26th, 1974.

It will be held on Thursdays (only), 10 a.m.—5.30 p.m. and the programme will include on this day all lectures and outside demonstrations.

The course covers the Syllabus of the Royal Society of Health, 13 Grosvenor Place, London SW1X 7EN, from whom copies may be obtained.

The College will also hold a new 'Environmental Protection Course' during the 1974-5 Year. This course is in two parts and applicants may take one or both parts.

Part 1—Noise prevention and control—is a re-modelled

course to meet the needs of officers and their assistants on problems of noise, investigation, assessments and monitoring. It includes considerations of planning, insulation against road and aircraft noise and a review of the Law.

Part 2—Pollutants (other than noise) their nature and control—includes the following subjects: Monitoring as an essential part of environmental health programmes. Identification of the related problems of air, fresh water, sea and land pollution. Industrial and farming wastes. Metallic contaminants and pollution from vehicles and aircraft. Inland waters, vessels and marina and holiday area problems. The new administrative and legal arrangements and functions in wastes disposal and water supply. The safeguarding of amenity.

Further information on both these courses can be obtained from Mr. D. W. Bottom, Principal Lecturer, S.E. London Technical College, Worsley Bridge Road, London SE26 5BD.

## AIR POLLUTION ABSTRACTS

**1324 River Pollution Prevention and its relationship with atmospheric pollution.** *T. W. Raven, Yorkshire Water Authority.* This paper stresses that river pollution prevention is a problem that has faced man since his beginning, with an impressive historical introduction which draws on early examples from the Holy Bible.

Against the background of existing legislation affecting water, a discussion follows relating river and atmospheric pollution, with special reference to problems of rivers in Yorkshire. Of the volatiles organo-chlorine compounds, transmittable through the atmosphere and returned to earth via rainwater were found to have wide dispersion; residues being found in birds' eggs in the Antarctic, mid-Atlantic islands and mountainous regions of Scotland. Poly-chlorinated biphenyls—until recently of wide ranging industrial application—were found in British birds—though their effects are sub-lethal. Metals contribution were related to the river Tame; and polynuclear hydro-carbons to carbon-electrode manufacture.

Measures to improve pollution factors of liquid wastes are mentioned with reference to smokeless fuel preparation and electrostatic precipitator wastes.

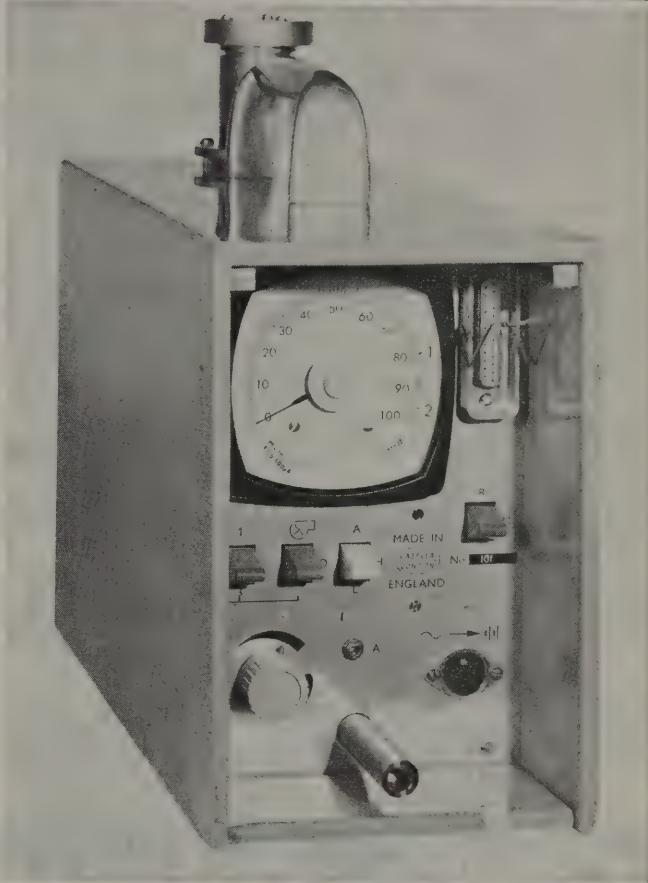
**1325 "Hot" versus "Enlarged" Electrostatic Precipitation of Fly Ash, A Cost-Effectiveness Study.** *Selzer, D. R. & Watson, Jr., W. D. Journal of the APCA, February 1974, Volume 24, Number 2.* This paper considers the problems of designing precipitators (for coal-fired electric power plants) which are cost-effective in the collection of low sulphur fly ash. "Hot" and "enlarged" precipitators are analysed. A hot precipitator increases treatment time and both are capable of precipitating low sulphur ash at high collection efficiencies. In a parametric comparison of hot and enlarger precipitation costs, it is found that an enlarged precipitator is likely to be less costly at high collection efficiencies.

The analyses uses data on 37 full scale precipitator systems to determine an empirical Deutsch-type efficiency equation. The predictive power of this equation is shown to be quite good in several tests using data from some additional precipitator systems which are treating low sulphur fly ash. Precipitator installation costs are estimated by minimizing precipitator accounting costs subject to this empirically derived efficiency equation. These costs plus others are derived both for hot and enlarger precipitation and serve as a base for making cost comparisons.

### **1326 Measurement of Rapid Changes of Odour Concentration by a Signal Detection Approach.**

*Berglund, B., Berglund, U., Lindvall, T. Journal of the APCA, February 1974, Volume 24, Number 2.* For many odorous industrial gases, odour detectability often involves such low concentration that the sampling time factor makes physical-chemical methods of analysis impractical. However, a sensory detection method based on signal detection theory has shown itself to be well suited for such studies even at levels near the absolute threshold. Experiments undertaken to assess the method are described.

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# SMOKE CONTROL AREAS

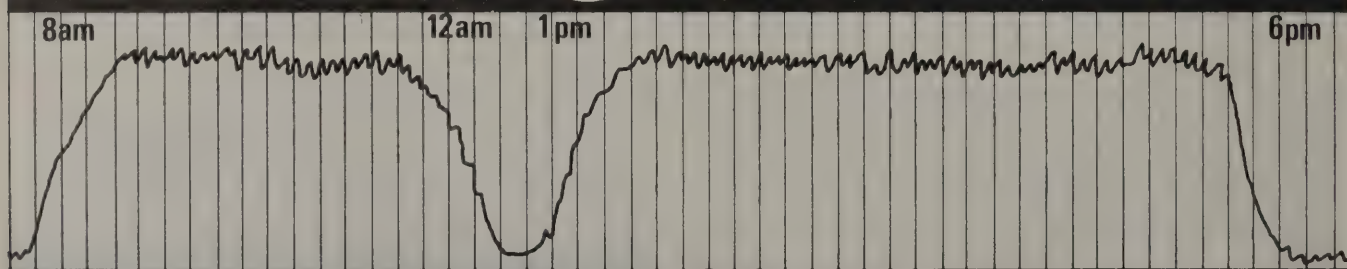
## Progress Report

Position at 30th June 1974

(Figures supplied by the Department of the Environment, The Welsh Office, The Northern Ireland Ministry of Development and the Scottish Development Department).

	England			Wales			Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 31.3.74</b>	4,339			19			228			58		
Acres .. .. .		1,354,345			2,855			121,430			14,107	
Premises .. .. .			6,127,295			10,499			524,316			34,456
<b>Smoke Control Orders Confirmed (31.3.74-30.6.74)</b>	57			—			4			—		
Acres .. .. .		30,396			—			2,145			—	
Premises .. .. .			91,786			—			11,978			—
<b>Totals .. .. .</b>	<b>4,396</b>	<b>1,384,741</b>	<b>6,219,081</b>	<b>19</b>	<b>2,855</b>	<b>10,499</b>	<b>232</b>	<b>123,575</b>	<b>536,294</b>	<b>58</b>	<b>14,107</b>	<b>34,456</b>
<b>Smoke Control Orders Submitted (31.3.74-30.6.74)</b>	24			—			—			2		
Acres .. .. .		14,179			—			—			960	
Premises .. .. .			38,915			—			—			4,707
<b>Grand Totals .. .. .</b>	<b>4,420</b>	<b>1,398,920</b>	<b>6,257,996</b>	<b>19</b>	<b>2,855</b>	<b>10,499</b>	<b>232</b>	<b>123,575</b>	<b>536,294</b>	<b>60</b>	<b>15,068</b>	<b>39,163</b>
<b>Smokeless Zones (Local Acts) in Operation ..</b>	44			—			—			—		
Acres .. .. .		3,400			—			—			—	
Premises .. .. .			41,060			—			—			—

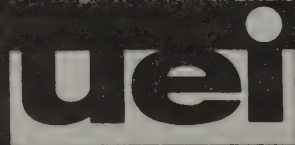
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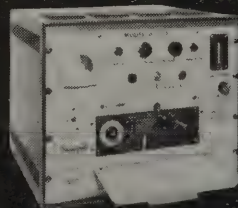
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# New Smoke Control Orders

The lists below are supplementary to the information in the last issue of **Clean Air (Summer 1974)** which gave the position up to **31 March 1974**. They now show changes and additions up to **30 June 1974**.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

The reorganisation of local government under the Local Government Act 1972 with the amalgamation into larger districts of many of the old units of local government rendered the division of the country into "black areas" and "white areas" out of date as from 1 April 1974. Because of this, the table showing the smoke control position in regions of England has been temporarily discontinued.

## ENGLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

#### Northern

Teesside C.B. ("H" and 14), Whickham U.D. (No. 13).

#### North West

Birkenhead C.B. (No. 27), Irlam U.D. (No. 6), Manchester C.B. (Moston).

#### Yorkshire and Humberside

Darton U.D. (Nos. 24, 25, 26, 27 and 28).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

#### Northern

Blaydon B.C. (No. 8), Boldon U.D.C. (No. 21), South Shields B.C. (No. 20), Sunderland B.C. (No. 13), Teesside C.R. (No. 20), Tynemouth (Nos. 18, 19 and 20, 1974), Whitley Bay B.C. (No. 11), Whickham U.D.C. (Nos. 16, 17, 18 and 19).

#### North West

Bury B. (No. 10), Kearsley U.D.C. (No. 7), Middleton B.C. (Rhodes No. 22), Whiston R.D.C. (Knowsley No. 3), Widnes B.C. (No. 14).

#### Yorkshire and Humberside

Bentley with Arksey U.D.C. (Nos. 6 and 7), Dearne U.D. (Nos. 9, 11 and 12), Doncaster R.D. (No. 3), Harrogate No. 3 (Valley Gdns.), Hoyland Nether U.D.C. (No. 4), City of Leeds (No. 120), Rawmarsh (Monkwood Stage 2, No. 1 and Stage 3, No. 2), Rotherham Town Centre, Rotherham Canklow, Stanley U.D.C. (No. 7), City of Wakefield (Belle Vue No. 1).

#### East Midlands

Beeston and Stapleford U.D. (No. 15), Derby B.C. (No. 29), Erewash D.C. (Ilkeston No. 10), City of Lincoln (No. 7), Mansfield B.C. (No. 8D), West Bridgford U.D. (No. 4).

#### West Midlands

Tamworth B.C. (No. 7).

#### Greater London

Havering (No. 8), Hillingdon (Nos. 25 and 26), Merton (No. 28), Waltham Forest (Nos. 21 and 22).

#### Eastern

Kings Lynn B.C. (Springwood, Marsh Lane, Marlborough Park).

#### Southern

Bracknell (No. 4 Priestwood and No. 5 Bullbrook), Reading B.C. (Nos. 20 Lower Caversham and 21 Whitley Rise/Basingstoke Road), Slough B.C. (No. 16).

#### South West

City of Bristol (Nos. 12 and 14), City of Exeter (Pennsylvania No. 2).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

#### North West

Bolton M.B. (Halliwell and West Ward), Lees (Nos. 3 and 4), Swinton Pendlebury (Nos. 10 and 11), Widnes B.C. (No. 15).

#### East Midlands

Chesterfield (No. 9 St. Thomas), Gedling D.C. (No. 1), Northampton C.B. (No. 11).

#### West Midlands

Walsall (No. 20 New invention), Warwick D.C. (No. 1).

#### Eastern

Thurrock (No. 11).

#### Greater London

Bromley (Nos. 22, 23 and 24), Enfield (No. 20), Harrow (Nos. 30 and 31), Merton (No. 29).

#### South East

Brighton No. 1.

## NORTHERN IRELAND

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Craigavon B.C. (No. 3), Belfast C.C. (No. 12).

## SCOTLAND

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Dundee (Linlathen), Glasgow (Partick), Milngavie (No. 4), Kirkcaldy (Chapel).

### SMOKE CONTROL ORDER WITHDRAWN

#### North West

Preston C.B. (No. 30).

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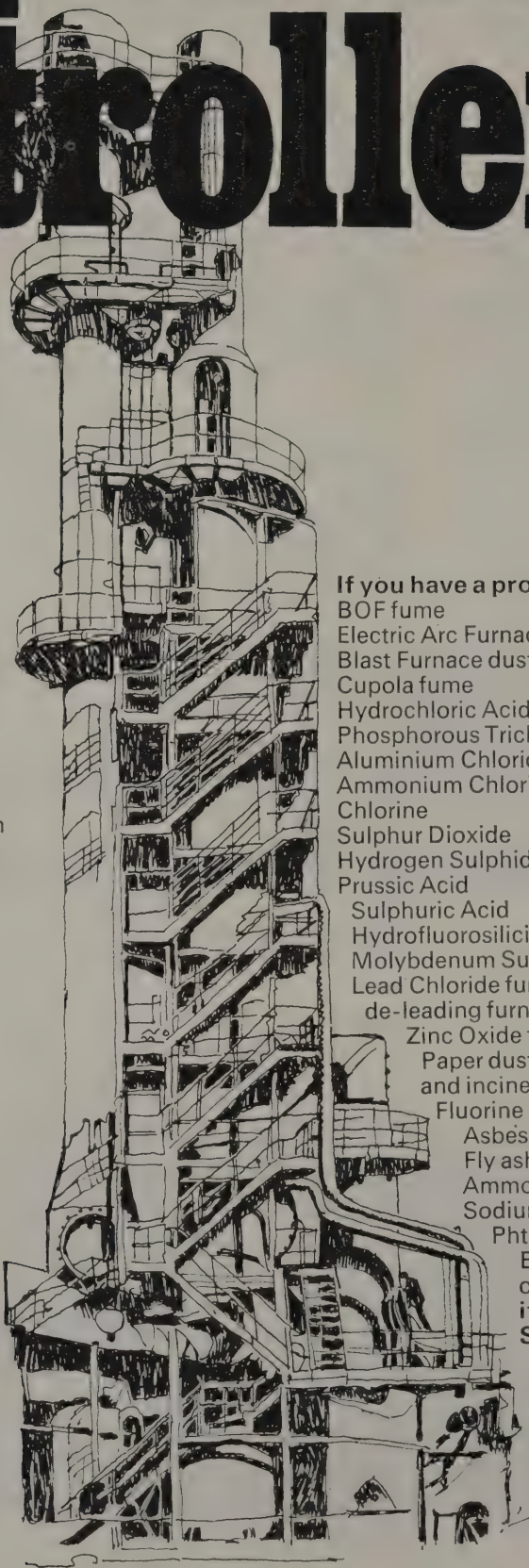
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# BOOK REVIEWS

## **In Defence of Economic Growth**

*by Wilfred Beckerman. Published by Jonathan Cape Ltd., 1974, pp. 287, £3.95.*

Professor Beckerman was a member of the first Royal Commission on the Environment, but was not always in agreement with his colleagues. The widespread concern about the environment the depletion of mineral resources and of fuel in particular, and the unprecedented growth of population have prompted a continuous public debate on these topics. Professor Beckerman pretends that the debate has made no progress and has educated no one, for him there seems to be no middle view.

In this context the pursuit of economic growth has been the subject of much serious and informed questioning, but Professor Beckerman harps on the 'eco-doomsters', extreme pessimists, from a few of whose writings he selects suitable aunt Sally material and duly knocks it. His logic is often an utter shambles; could it be because economics is not a fundamental subject, with a basic principle subject to ruthless test as in mechanics and physics, but merely a collection of what economists have managed to think of in the muddled world of cause and effect? The manner of argument seems to facilitate the omission of factors which are relevant but awkward to handle. Sometimes they are included in the discussion in a theoretical way though it is admitted that often they cannot yet be quantified and managed in practice.

The middle section of the book is really irrelevant to the issue of growth or no growth, but is of interest because it is concerned with the use of pricing mechanics to control pollution. Pollution is a field in which the costs are external and the objective is to internalise them to ensure that they are considered when plans and decisions are made. The discussion takes place around the assumption that every industrialist is or should be deeply concerned with costs to the exclusion of almost everything else. In practice many are too busy already with all the other problems of management to be much concerned about minimising their costs in the context of a system of pollution pricing, by which is meant the payment of a levy on the pollution emitted into the environment. Indeed the success or failure of a business is likely to depend as much on the public relations engendered by an enlightened environmental policy as on the minimising of pollution costs.

The policy of economic incentives is supported by statements such as that US environmentalists have been won over to it. That is not surprising in a country where the profit motive is far more dominant (or thought to be) and where there is almost no experience of control by other methods. When it is objected that firms will not necessarily make careful calculations to minimise their costs, Beckerman argues that the same could be said of their investment decisions and much more beside, a curious logic. Pollution is external and if they are not enlightened enough to be efficient in their own case, it

is likely that they will be less studious on behalf of others—if the profit motive is relevant at all.

In the case of water pollution it would be difficult to invent an effective and fair pricing system because of the variation in river flow and the changes consequent upon that of the relative importance of upstream pollution sources. Beckerman would not argue that the costs must be varied according to day to day experience or to a complicated formula which includes the varying factors, and so his objective of optimising the use of the environment as a sink of pollution cannot actually be achieved with precision. Indeed he specifically suggests a very crude pricing formula.

If the financial incentives are to mean anything they must be steady enough to facilitate long term planning. But they must also be flexible enough to permit further development and the entry of new users into a piece of environment, and must therefore be liable to continual negotiation and variation. In the case of air pollution the obvious complications due to chimney height, design, and location in the infinite succession of weather mean that crude pricing formulas could have no sure effect towards minimising total real costs. Continuous monitoring and recording with all its attendant bureaucracy would be required for all factories in the place of the present less burdensome sampling requirements.

One suspects that Beckerman is so attached to pricing that he believes it cannot help being the most effective way to achieve an end. He does not see that most decision-making is not made on the basis of a costing except in the broad sense to see whether an intention is feasible. Indeed the choice is not usually between one method of pollution abatement and another with different costs, or between not polluting or paying. It is about spending much more on pollution abatement or more on something else which is unrelated and very subjective.

It is an article of faith with economists that a decision represents an evaluation, even if it is subjective, which can in principle be expressed in money. The fact that preferences are cultural and vary significantly according to personal and public choice, precedent, inheritance, personality, flukes of history and so on, proves to them that if we all come to different decisions most of us must be operating inefficiently and at unnecessary cost. The origin of this simplistic outlook is probably the relative simplicity of the laws of mechanics and physics which it would be very nice to have in economic theory. Economics seem to have gone too far in postulating a theoretical universal currency while natural scientists have long recognised that units of mass, length, and time cannot be mutually converted, and that for many important purposes other quantities such as heat, momentum, electric charge, etc., are also immutable. They seem to have left out time, too. Thus in situations in which we now let old equipment have an extended

run until it has paid its way, the pricing system suggested could make no allowance for the different costs under which the original investment was made. But, Beckerman would probably say, the same could be said of changes in the prices of raw materials, which makes it all right.

In the chapter on "The burden of environmental protection" many of the repercussions both regional and international are discussed. It is an interesting lecture on elementary economics. One would think that pockets of unemployment etc. never occurred except where there had been no careful economic planning. The real world where politicians are on the look out for such evils and institute correctives when they can contain the field of pollution too and the procedure is essentially the same: many methods of control are used which range from economic incentives to the use of planning powers, directives, and licences.

One cannot avoid the impression that for some economists the world has its real existence in filing cabinets. Unlike my accountant who includes his fee as a tax deductible expense, the economists do not appear to include as a cost the vast army of accountants and computers which would be engaged if they could have their way. Sometimes it is better to make a simple quick decision and gain experience of management rather than bother to do an advance costing. Anyway, how do you price pollution not yet experienced? Must we never prevent it happening first time? Beckerman (p 197) claims that the pricing policies he advocates have been a significant cause in the reduction of ground level  $\text{SO}_2$  from certain large sources in Brittany. It must be generously suspected that he meant to refer to policies outlined in a chapter other than the one he actually refers to. There is a brief reference to the success of British policy, his point there being that it was successful in a period of economic growth. But he wants it both ways. He is proud that we are being successful in reducing the lead content of petrol. This however is a case where an economic review has not been made a consideration but would do good because we have as yet no evidence that there will be any benefit at all from reducing lead below 0.5 grams per litre. Nevertheless it will cost us £30 million a year in adverse balance of payments on our oil bill. Such presumably is the current price of placating the environmental hot-heads, and if that is how to use Beckerman's criteria presumably it's all right!

*Professor R. S. Scorer*

Reader Enquiry Service No. 7460

### **Physiological Effects of Noise**

*Edited by Bruce L. Welch and Annemarie S. Welch.  
Published by Plenum Press, London-New York. £10.35.*

This is not a textbook or a complete review of the Physiological Effect of Noise, so the title is somewhat misleading, but a publication of related papers presented at an international symposium on the Extra Auditory Physiological Effects of Audible Sound held in Boston, Massachusetts in December, 1969. Such publications are usually valuable additions to scientific literature and this one is no exception.

The organisers, recognising that Noise as a pollutant was a matter of increasing public concern, arranged the symposium but required the contributors to discuss and disclose the acute and cumulative extra-auditory, rather than the auditory effects of noise, since the latter are

more clearly understood and documented. As a consequence the effects of audible sound upon sleep, susceptibility to infection, cardiovascular, reproductive, endocrine, metabolic and neurological functions are all referred to. The final section is concerned with studies of the effects of sonic booms from supersonic aircraft. On the "Awakening Effects of Sonic Booms" the author concedes that because of the small number of subjects involved the results must be considered with some caution, and the papers concerned with the effects on farm raised animals and the hatchability of chicken eggs reveal no adverse effects so this is reassuring. The last paper, a review on "Man and the Sonic Boom" is both informative and sensible. All the papers are interesting contributions and in addition to presenting information that is now relatively well established, include new data derived inevitably in many instances from animal experiments.

It is inappropriate to single out any one contributor from the distinguished group of world scientists because all the papers are well written and illustrated, with extensive bibliographies. The type script is easy to read and there is no reflective glare from the paper. Although concerned with a subject of great topical interest, this publication is too technical for the casual reader. It is produced for the research worker in this field, and for him it is essential reading.

*P. L. Pelmeur*

Reader Enquiry Service No. 7461

### **Environmental Pollution by Pesticides**

*Edited by C. A. Edwards, Plenum Press, London and New York, 1973, pp. 542. £10.00.*

This is the third in a series of volumes about research in environmental science; the first two volumes dealt with Indicators of Environmental Quality and with Engineering and Scientific Solutions to Pollution. It comprises thirteen chapters each written by acknowledged, international authorities in their particular fields of research. The fields range from problems of analysis through the occurrence of pesticide residues in plants and in various groups of animals as well as in food, air, soil and water. The final chapters deal with the dynamics of pesticide residues in the environment and with residue degradation.

The editor, fully aware that the subject has aroused considerable controversy, has aimed to present facts about the extent of problems that arise from the use of pesticides. It is worth noting that pesticides are substances used to prevent or destroy pests including insects, spiders, nematodes, fungi, weeds and, indeed, most organisms which have an adverse effect on man, the production of his food, or on forage and fibre plants. But the same substances, or their degradation products, often present a hazard to other organisms in the environment, and to man himself. Although the control of pests that limit the production of crops goes far back into history, the problem of serious contamination of the environment arose in the 1950s, when large residues of synthetic organic pesticides, especially of D.D.T., were found not only close to where they were used, but also in more remote sites often where they were not expected. Research workers were alerted and a wide variety of plant and animal material was analyzed so that a considerable volume of literature has built up about the fate of the more persistent pesticides—and of the less fortunate organisms which were not the intended 'targets'.

Many of the studies with plants and animals have established principles that are essential to the design of efficient monitoring systems to protect domesticated and wild animals and man from the possible hazards of over-exposure to pesticides. The studies have been reviewed in a comprehensive manner which varies a little from chapter to chapter.

It is apparent that there has been a considerable advance in analytical techniques which allow the detection of very small amounts of pesticide residues precisely and definitively; the first author will satisfy most readers that such detection can now be achieved although he leaves a slight doubt about some things that have gone before.

On the whole, the authors adhere to the editor's main aim, and they avoid emotive statements. Nevertheless, readers may obtain different pictures about a similar topic from two successive chapters concerned with pesticides and fish. Generally in the aquatic environment, concentration of pesticides through food chains—or biological magnification, as it is called—represents the major pathway through which hazards may arise. Direct absorption of pesticides from water by aquatic organisms in rivers, lakes and oceans appears to present less of a problem. In these ecosystems, and indeed in land-based systems, it is suggested that the processes of movement of pesticide residues are understood much better in qualitative than in quantitative terms. When sums are done and balances of the amounts of pesticides used are compared with amounts accounted for, unexplained losses give rise to serious concern. One can sympathize with the difficulty of making such balances when one realises how low is the concentration of residues in various components of the environment.

It appears that man and most large animals are able to cope with the problems of residues especially if they have a varied diet. However, there is a tendency for some pesticides to become more concentrated, in terms of body burden, as they are passed along food chains so that animals at the end of a food chain, may suffer quite considerable reductions in population size. Birds of prey, especially predators of other birds or fish, are particularly vulnerable and I found the account of "The thin eggshell problem" in Chapter 7 interesting and illustrative of what the whole volume is about.

Many readers may be attracted by Chapter 9, which is entitled "Pesticide Residues in Man". I found it well balanced and readable. It is reassuring, if somewhat callous, to note that the levels of residues in the blood serum of people involved with the manufacture of D.D.T. is 15 to 50 times higher than in persons in most walks of life, but that no symptoms of disease have been associated with the higher levels.

Readers of this review will be particularly interested in the chapter written by G. A. Wheatley which deals with 'Pesticides in the Atmosphere'. He gives a very useful account of the general role of the atmosphere as a sink and as a dispersal medium for pesticides. He outlines the basic chemical and physical principles that govern the movement of substances to, in and from the air, as well as indicating the difficulties of measuring residence times of persistent, relatively non-reactive pesticides. Almost always pesticides are discharged into the atmosphere on their journey to the target organism. On the whole this chapter is well written, but one is dismayed to see that he suggests (p. 367) that, "Public awareness of the problems of atmospheric pollution began about twenty years ago".

Although agriculture, horticulture and forestry may be primary contributors to residues in the environment, one detects in various chapters a feeling that these industries may receive an unfair share of blame for such pollution. In trying to meet demands for more food-stuffs they may have unwittingly introduced undesirable residues. Nevertheless, pesticide use is by no means limited to these industries and one suspects that elsewhere their use is subject to less scrutiny and control.

The book is well prepared and presented, the bibliographies and index are appropriate and helpful. The text appears to have few errors, but there is some difficulty with units which arises from conversion of the American billion (p. 195-6), or from the use of negative indices (p. 389). The book is a very valuable review of the problems of pesticides and the environment and should prove a useful source of reference for an increasing number of persons in a variety of disciplines.

D. W. Cowling

Reader Enquiry Service No. 7462

### Energy and the Environment

*The Royal Society of Arts. £3.00.*

In March 1973 the Committee for Environmental Conservation (CoEnCo), which constitutes a forum for discussion of environmental questions of national concern by the major conservation amenity bodies in this country, and of which the Society is a member, began to look at energy questions in the environmental context. This arose from consideration of the exploitation of North Sea oil but it soon became clear that any such study should not be limited to this problem alone.

In consultation with the Royal Society of Arts, it was then proposed that a Working Party, composed of representatives from CoEnCo, the Royal Society of Arts and the Institute of Fuel, would form a most appropriate multi-disciplinary group to tackle the issues involved. This proposal was agreed and the announcement of the formation of the Working Party was made by his Royal Highness, the Duke of Edinburgh, at the "Fuel and the Environment" conference held by the Institute of Fuel in Eastbourne in November 1973, in his capacity both as Chairman of the organising committee of this conference and as President of the Royal Society of Arts. This Report is the product of that Working Party. The working party started work in November 1973 under the Chairmanship of Lord Nathan of the Royal Society of Arts with the following Terms of Reference: "To examine and report on environmental implications of the development and use of the energy resources available to Britain."

Rear Admiral P. G. Sharp, the Secretary General of the Society, represents the Society on CoEnCo and has been involved with this Working Party from its inception and has been very much concerned with the production of the Report. The Report was published on the 11th July and this, by happy chance coincided with the Government's statement on energy and their plans for the future.

As the first of the principal conclusions in the Report states, the continuing theme throughout has been that the exploitation and use of our energy resources must be carried out with the fullest regard to the need for proper safeguarding of all aspects of our environment. Accordingly the major recommendation made in the Report is that "an energy commission should be established; (a) to advise on the overall planning and management

of energy resources. (b) to have regard, as trustees for succeeding generations, to the continuing availability of resources and the maintenance of the environment. (c) to undertake, commission and publish research on the widest possible range of matters relating to these Terms of Reference".

The Report expresses anxiety about the long term safety of the use of nuclear energy; it criticises planning procedures and recommends that the public enquiry should be made to work more effectively. More information should be made available to the public well in advance of any enquiry both about the developer's intentions and about any likely environmental impact of the proposals. The Working Party suggests that a policy for development of energy resources must be created in the context of the environmental and social consequences to develop a sensible policy for the future use of energy.

The question of the future use of nuclear energy is fully examined and hazards in various designs of nuclear power stations are discussed.

The Report has been drafted with the aim of informing the general public. It is written in a way and in language which the layman can understand. As is only to be expected when a number of different authors have contributed, the style varies somewhat; nevertheless the Report is eminently readable and, it is hoped will cause many people, including members of the Government, furiously to think.

Copies of the Report are available on loan from the Society's library.

Reader Enquiry Service No. 7463

### Environmental Pollution Control

*Edited by Allan D. McKnight, Pauline K. Marstrand and T. Craig Sinclair. Published by George Allen & Unwin Ltd., 1974. £6.75.*

The book deals with the technical and legal aspects of air and water pollution both in relation to inland waters and the sea. In addition there are chapters on noise and land dereliction which in all make up a volume of 324 pages, divided into 12 chapters. The problems of defining pollutants, the hazards involved and the methods of control available are explained and examined in such a way that clearly shows that the ten authors have each given considerable thought to their subjects.

Publications, when the majority of the chapters are written by different authors are notoriously unsatisfactory as this usually leads to glaring omissions or duplication. However, these criticisms cannot be levelled at this book as a chapter is devoted to each subject or part subject depending upon its importance to the main theme.

In a volume of this size it is impossible to completely cover any aspect of environmental pollution, but Professor J. Garner certainly makes an admirable attempt in his contribution on 'The Law Relating to Air Pollution in the United Kingdom'. I willingly forgive the inaccurate estimate of the number of Alkali and Clean Air Inspectors (about 20 instead of 35 plus Headquarters Staff) because of his forthright conclusions. He states clearly that in his opinion it is preferable that the Alkali and Clean Air Inspectorate be retained as a small centralised research unit and the work of air pollution control handed over to local authorities. Professor Garner also calls for a drastic overhaul and strengthening of the legislation relating to motor vehicle exhausts, the use of default powers where local authorities are lagging in

making smoke control areas and the need for improved training and specialization in air pollution.

Those of us who have either listened to papers given by Professor R. S. Scorer or read his previous writings know what to expect in his chapter on 'The Technical Aspects of Air Pollution'. This is really a massive subject to cover in 20 pages and the author tends to leave the reader with a sense that all is reasonably well, an attitude that most of the other authors endeavour to dispel.

'Pollution by Noise: Sound & Technical Aspects' is written by Charles Wakstein of the Open University. Whether one agrees with all Mr Wakstein's views or not he is certainly to be congratulated for the enthusiastic way in which he makes out a case for more speedy action against noise and for research work to be carried out. Those working in noise control may feel that properly used the Land Compensation Act 1973, The Noise Insulation Regulations 1973, Circular 10/73 Planning & Noise etc., to say nothing of impending legislation on noise control areas, have produced fairly rapid progress in the control of noise. In fact I think most people would agree that legislation, and to a reduced extent, action to control noise has developed and expanded more quickly than any other subject in the environmental health field. However, reading Mr. Wakstein's chapter will quickly dispel any complacent views that the reader may have and leave him with a feeling that here are problems worthy of more time, effort and money. The theme that there should be a much more urgent approach to environmental pollution control is also strongly supported by Allan D. McKnight in his chapter dealing in general with 'Law and Administration'. Mr. McKnight believes that overall the picture shows how much needs to be done in Britain in the legislative, administrative and judicial fields if governments are to cope with the massive problems of present day pollution. He feels that although a great deal of good work has been done in the U.K., particularly when comparisons are made with other countries, this is still no excuse for sitting back and congratulating ourselves.

The chapters on 'Pollution of Inland Waters', 'Land Reclamation' and 'Pollution of the Seas' make interesting reading and are instructive. In particular sea pollution is dealt with by Pauline K. Marstrand, in an extremely clear and uncomplicated way and shows in the limited space available how this aspect of pollution is underrated.

The editors claim that a substantially different approach has been used to that in other books dealing with environmental pollution control: a claim which is particularly justified when one remembers that the book is primarily aimed at a wide range of people interested in environmental pollution problems and not so much at persons actually engaged in endeavouring to control one or more aspects of pollution. Full bibliographies are included at the end of each chapter and the object of providing a survey and introduction to the subject is achieved.

These are a few minor inaccuracies and omissions while sections of the technical chapters are based on personal opinions with which not all readers will agree. However, it is an eminently readable book which if it assists in dispelling the sense of complacency that can be detected on occasions in some civil servants and local government officials, will perform a useful function.

C. R. Cresswell

Reader Enquiry Service No. 7464

### Electrical Association for Women

*49th Annual Report 1973, and Report of the Caroline Haslett Memorial Trust.*

The EAW is an independent voluntary women's organization that teaches people how to use electricity safely and efficiently in the home, provides a platform for the expression of the woman's point of view on the design and performance of electrical equipment and helps to create an informed public opinion on the contribution which electricity can make to home-making and the welfare of the community.

There was an increase of 25 per cent in the number of enquiries concerning electrical equipment made to the Home Economics Department during 1973, largely due to an increased programme of publicity in the press and several appearances on radio and television. The restrictions on the use of electricity towards the end of the year also called for extra effort from EAW members all over the country, as they were put in the unique position of explaining to less well informed members of the community how to use their electrical equipment economically as well as safely.

The educational programme of the Association continued unaffected, however, with members of the EAW giving talks and practical instruction on the use of electricity in the home to many varied audiences. The EAW also continued to provide a Home Electricity Course for inclusion in the science or home economics curriculum of schools, technical or training colleges.

Reader Enquiry Service No. 7465

### Chemistry of the Lower Atmosphere

*Edited by S. I. Rasool. 335 pages. Published by Plenum Press. £11.90.*

Like many works of its type, "Chemistry in the Lower Atmosphere" is really an anthology and has not been edited by S. I. Rasool but compiled by him. Thus, in Chapter I we are introduced to the word "anthropogenic", which appears to mean "man made" in a slightly pejorative sense ("Anthropogeny" means the study of man's origin) and the "troposphere" but it is not until Chapter II that this is usefully defined as the lowest region of the atmosphere extending from the earth's surface to the tropopause—the altitude at which ambient temperature ceases to decrease.

Similarly, the  $\text{CO}_2\text{-H}_2\text{O}$  system is discussed in Chapter 3 and much more fully in Chapter 6.

The six chapters in the book contain enough information and useful discussion on which to construct a very good insight into the effect of pollution, both natural (very largely from volcanic eruption) and artificial, on the atmosphere—for the book is not confined to the troposphere; Chapter 5 contains a fascinating analysis of the likely effect of supersonic aeroplanes on the stratosphere.

Of the six chapters in the book, two are particularly good: Chapter 2 dealing with particulate matter in the lower atmosphere and Chapter 5, on the chemical basis for climate change, both of which are written by workers at the National Center for Atmospheric Research at Boulder, Colorado.

In Chapter 5 the theory underlying the "greenhouse" effect is very clearly described and this underlines the importance of  $\text{CO}_2$  concentration in the atmosphere, which, it is pointed out in Chapter 3, has been increasing at a rate of 0.2 per cent per year between 1958 and 1969.

Thus, Chapter 6, dealing with the carbon dioxide cycle is of great relevance; it is pointed out that the observed increase in  $\text{CO}_2$  concentration is only about half of the figure that would be reached if all the  $\text{CO}_2$  emitted remained in the atmosphere. The reasons for this are, as yet, imperfectly understood, as are the reasons for the observed values of other pollutants (hydrocarbons, oxides of nitrogen, and particularly  $\text{SO}_2$ ) being similarly less than they would be if they accumulated in the air. The various mechanisms for their elimination are discussed, a full chapter being given to the global sulphur cycle.

Particulate matter can also have a profound effect on the atmospheric environment and this is also fully considered and the interaction between particulate pollution, cloud formation, and precipitation particularly well discussed in Chapter 2.

The book has a good index and is well produced; the reviewer found only one typographical error. One would like, however, to see an edited version—a review of the whole subject expressed with minimum mathematical analysis, with the more mathematical approaches given as appendices.

*D. H. Sharp*

Reader Enquiry Service No. 7466

### Campaigning for the Environment

*Richard Kimber and J. J. Richardson, Routledge and Kegan Paul, London, 228 pages, £4.95.*

As the preface to the book states "This book arises from a research project, begun in 1971, on the role of environmental pressure groups in the political system". The book consists of an introduction and seven case studies covering important aspects of environmental campaigning, where the environment has been threatened and where so-called "pressure groups" have been formed to defend it. The studies not only reveal the widespread concern for the environment but also show the problems encountered, usually political ones, and how these were overcome or were not overcome in each case.

The studies include the preservation of the history and character of the City of York; the National Smoke Abatement Society and the Clean Air Act, 1956; power lines across the South Downs; the politics of Manchester's water supply, 1961-67; The M4 and its route; public opposition to heavy lorries (juggernauts); and the fight put up by Cublington against the third airport.

The Chapter on the Society and the Clean Air Act was first published in 1961 and has been reprinted. The Chapter on the M4 previously published in 1967, has also been reprinted. All the other Chapters are new. Finally, the book is rounded off by a conclusion in which tactics and strategies are examined.

The book is eminently readable and is well documented. Each Chapter is in its own way different, but clearly tells the story of success or otherwise from the viewpoint adopted. Sometimes the restrained approach, as was adopted by the Society over the Clean Air Bill, can be more successful than the more vociferous and widely publicised activity of the true pressure groups. Sometimes objectors failed because they were not properly organised and lacked administration; at other times only partial success was achieved because different groups failed to combine or were squabbling amongst themselves.

Altogether this is a most interesting series of studies which make exciting—and that word is used advisedly—reading. The book would have been much improved had adequate maps and diagrams been included; there is only one rather inadequate map in the whole volume.

Reader Enquiry Service No. 7467

### **Air Quality Abstracts**

*A special compendium published by Pollution Abstracts Inc., La Jolla, California. 773 pages. \$75.*

As the opening sentence in the foreword says "Air Quality Abstracts is designed for librarians, engineers, consultants, government administrators, business executives, research and development personnel, teachers, students and others who must locate specific air quality information quickly and easily."

This is a mighty tome containing summaries of up to 200 words each, giving the highlights of recent air quality literature. The abstracts are arranged in ten different groups and those that have reference to more than one subject appear in all the appropriate sections.

The book includes over 5,000 abstracts from all over the world, but as might be expected, the publications in the United States are in the majority. This is an extremely useful book which no reference library should be without. It is comparatively easy to use, but the value of the book would have been enhanced considerably had it contained a suitable index.

Reader Enquiry Service No. 7468

### **The Alkali Inspectorate**

*A Report by Social Audit, 48 pages. £1.00.*

It is fashionable at the moment to "knock" the Alkali Inspectorate and this Report by Social Audit, a non-profit making body that investigates Government and business, does just that.

The Alkali Inspectorate is described as "at least as dedicated to preventing the release of pollution data as to preventing the pollution itself" and the Report points out that the Inspectorate is not required by law to prevent the public from seeing data on the pollution of factories it controls.

The Report is apparently well documented. But such documentation as there is all one sided; it is misleading and the Report is certainly not objective. It is far from fair, and to a large extent it depends on half-truths.

The Inspectorate's policy of "confidentiality" comes in for special criticism and yet the Report was published at a time when the then Protection of the Environment Bill had already passed through many stages in the House of Lords and when the Health and Safety at Work Bill was under consideration. Virtually no account has been taken of these two pieces of legislation which, in their different ways are designed to strengthen the Alkali Inspectorate and to make available to the public much more information about emissions to atmosphere by industry.

The Report says that the best course for the Alkali Inspectorate's future might be for it to become an advisory body with the actual mechanics of pollution control as the responsibility of local authorities. But the Report does not say whether the local authorities themselves are in a position to carry out such control.

Some may be, but we do not believe that the majority are yet in a position to undertake this work.

We would agree that the Alkali Inspectorate needs strengthening. We would also agree that sometimes it could be tougher in its approach to certain industries. On the other hand, we can all be thankful that we have had an Alkali Act and an Alkali Inspectorate for something over 100 years. The interpretation of this Act by the Inspectorate and its work are to a large degree responsible for the much cleaner air that we enjoy in this country compared with that in many other countries.

Reader Enquiry Service No. 7469

### **New additions to the National Society for Clean Air Library, available on Loan**

Council for the Protection of Rural England; **Development Control: Package Buildings.** 1974, 15 pence.

Council for the Protection of Rural England; **Transport—Co-ordination or Chaos?** 1974, 15 pence.

Department of the Environment; **Progress Sustained: Changes in the British Environmental Scene.**

Department of the Environment; **The Monitoring of the Environment in the United Kingdom.** 1974, 50 pence, H.M.S.O.

Kimber, R. & Richardson, J. J. **Campaigning for the Environment.** Routledge & Kegan Paul. 228 pages, July 1974, £4.95.

Social Audit; **The Alkali Inspectorate; The Control of Industrial Air Pollution.** A Special Report. Spring 1974.

Nonhebel, G. **Chemical Engineering in Practice.** Wykeham Publications Ltd. 180 pages, £2.25.

U.S. Environmental Protection Agency; **Flue Gas Desulfurization: Answers to Basic Questions.**

U.S. Environmental Protection Agency; **Air Pollution Translations: Volume 5.** A Bibliography with Abstracts. February 1974.

U.S. Environmental Protection Agency; **Lead and Air Pollution: A Bibliography with Abstracts.** 1974.

Pollution Abstracts, Inc. **Air Quality Abstracts.** 800 pages.

Rasool, S. I. **Chemistry of the Lower Atmosphere.** Plenum Press. 330 pages, 1973, £11.90.

Electrical Association for Women. **49th Annual Report.**

County Borough of West Bromwich. **Annual Report of the Hygiene and Cleansing Department.** 1973.

The Royal Society of Arts. **Energy and the Environment.** £3.00.

Edwards, C. A. (Ed.). **Environmental Pollution by Pesticides.** Plenum Press, London and New York, 1973, pp.542, £10.00.

Bruce L. Welch and Annemarie S. Welch (Ed.). **Physiological Effects of Noise.** Plenum Press, London and New York, £10.35.

Wilfred Beckerman. **In Defence of Economic Growth.** Jonathan Cape Ltd., 1974, pp.287. £3.95.

# The Future of Home Heating

Paper presented by I. C. Kirkwood, B.SC., C.ENG., F.I.MECH.E., F.I.H.V.E., M.CON.S.E., to the 1974 Scottish Conference of the National Society for Clean Air

The National Society for Clean Air has, of course, never had any doubts about the need to control air pollution. I am happy that the control of fuel or energy consumption has an additional benefit, a reduction in air pollution.

At the present time I need not emphasise how important is the cost of heating, and the steps that can and will be taken to reduce this cost. The energy crisis and inflation are already matters which everyone now accepts as falling within their own knowledge and experience.

Perhaps we should not over stress the question of an energy crisis. In the long term, possibly outwith our own lifetimes, fossil fuels such as coal, gas and oil may become in such short supply that their use may no longer be allowed for space heating.

The shorter term problem, however, is to reduce the consumption of these fuels to match the currently reduced available supplies, and to provide a better service from smaller quantities of fuel, both in the interest of fuel conservation and monetary economy.

The short term problems can certainly be solved by the use of well known and documented technology. The longer term problem will require the application of new technologies on which we are now only on the fringe.

Let us therefore consider today the shorter term problems, that problem with which we are each engaged in our respective activities.

Before approaching the future, can we for a moment look back at the past. The further we look back into history, the more clearly we shall see the simple solutions which were then used to provide a semblance of comfort when fuel was in limited supply, and when there was no such science as fuel technology.

Can each of you visualise a derelict highland cottage, a low solidly built structure with small windows, solid floor and thickly thatched or tufted roof.

Or again, an eskimo igloo, again a low solidly built structure, with solid floor, but in this case no windows and an exceedingly small entrance, probably facing down wind.

Both these types of building supported human life when fuel was not plentiful, and both exhibit characteristics which we should bear in mind today.

What then are these features?

- (a) A thick heavy structure, in modern terms good thermal insulation.
- (b) Compact dimensions, and hence more readily warmed by a small quantity of energy.
- (c) Minimum areas of doors and windows to maintain the insulation of the basic structure, and to reduce ventilation to a minimum.

The size, shape, aspect and exposure of any building does, of course, affect the heat energy required to maintain comfort within it. Heating engineers have developed systems of heat loss calculations to establish the amount of heat required to maintain specified conditions.

More important in today's fuel position, similar calculations can be applied to establish how much fuel saving can be expected from the application of higher standards of thermal insulation, and lower standards of ventilation.

I would be the last to suggest that we revert to the housing of our great-grandfathers, or of the Eskimos, but let us not forget that they found simple solutions to basic human needs.

In today's technologically based society, we can too easily aspire to complex and expensive solutions, which give rise to heavy capital and operating costs and considerable maintenance and replacement costs in later years.

Let me now turn to the first section of my brief for today.

## *The Future of Home Heating*

Let us first of all consider what is the object of home heating. I suggest to you that the object is to provide conditions of comfort suitable to the particular room concerned, and the activity of the occupants within it.

Here we meet our first problem, no two people react in exactly the same way to the various factors having a bearing on comfort. These factors include the ambient temperature, mean radiant temperature of the surroundings, air velocity and humidity and the clothing, activity, age and state of health of the occupants.

A great deal of fundamental research has been carried out, but the best definition is still that determined many years ago by Dr. Bedford, which can be paraphrased as "the condition in which 90 per cent of the occupants will be satisfied".

To provide reasonable standards, the I.H.V.E. sets out in its Guide to current practice, the ambient temperatures and external temperatures which should be used for the design of heating installations. More recently they have expanded their design recommendations to take into account the mean radiant temperature of the internal surfaces of the room.

It should be mentioned here that with a higher mean radiant temperature of the building, such as is realised with better standards of thermal insulation, comfort can be achieved at lower ambient temperatures, and consequently with lower energy consumption than hitherto.

The second point we should consider is that whatever solution is proposed for domestic heating, the resulting installation must produce operating costs which the intended occupants are prepared to pay.

This is an exceedingly difficult condition to satisfy, as few people are prepared to pay the market cost of comfort, and generally consider the cost out of proportion to their expenditure on rent, rates and other household expenses. Naturally they are even more reluctant to accept economic heating charges, where they enjoy the privilege of housing at less than economic rents.

In an effort to meet this problem, it may well be necessary to reduce the standard of heating service offered well below the ideal concept of a full heat service, throughout the heating season, in all the rooms of the house.

What then are the factors which, added together, determine the economic charges for the heating plant, and what steps can be taken to reduce each to the lowest cost, compatible with a reasonable standard of comfort.

In general, these costs fall either into capital charges or into operating costs, and consist of the following:

#### *Capital Charges*

- (a) Interest, repayment and replacement costs of the heating plant and the associated builderwork, including access roads required specially for fuel delivery.
- (b) Interest and repayment charges on higher standards of thermal insulation put forward to reduce energy required, and to reduce the capital cost of the heating plant.
- (c) Interest charges on capital expended during the construction period, before the plant is fully developed and paying its way.

#### *Operating Costs*

- (d) Local authority rates on the proportion of the rateable value of the property attributable to the heating plant.
- (e) Fuel cost.
- (f) Cost of labour for operating and maintenance of the plant.
- (g) Removal of ash where applicable, and cleaning of flues, boilers and chimneys.
- (h) Cost of lubricants, chemical treatment and replacement parts.
- (i) Insurance of plant.
- (j) Administration, supervision and meter reading costs, where a group or district plant is being considered.
- (k) Value Added Tax.

This is a formidable list and many authorities are already aware of the problems of reconciling the true operating costs to the charges the occupants are prepared to meet.

Let us look at each of these costs and see in what directions economies can be made, particularly at the design stage and in the conception of the service which the plant is intended to offer.

#### *(a) Interest, repayment and replacement cost of the plant*

In this element, interest and repayment charges are determined by the current financial conditions, and are generally outwith the control of the engineer. Financial guidance is required on where the most favourable source of capital can be found.

The replacement cost of the plant can be spread over a greater number of years by the use of high grade

materials and plant, by the choice of fuel and by skilled maintenance and supervision of the plant.

#### *(b) Interest and repayment charges on higher standards of thermal insulation*

The first thing to be recognised is that the cost of insulation will be recovered in a few years from the saving in fuel which it achieves.

The second consideration is that insulating materials in common use can be expected to have the same life as the building structure, and replacement is rarely necessary.

The capital charges of additional insulation are rarely significant and on this item attempts to reduce the initial capital expenditure, are a false economy.

#### *(c) Interest charges on capital spent during the construction period*

Here the shorter the construction period, the smaller the charge. It is obviously costly to install a major plant and distribution system to serve a very large development, and then to find that the development proceeds so slowly that the earlier part of the development cannot carry the costs of the capital committed.

The plant must be developed in a phased relationship to the load, and smaller temporary plants may require to be incorporated.

#### *(d) Local Authority Rates*

Little can be done by the engineer to reduce this burden, but its cost must be taken into account.

Some forms of heating, such as electric storage heaters, may be regarded as 'movable equipment' and be free from this burden.

#### *(e) Fuel Cost*

All parties in the development have an influence in the final fuel costs of any proposal, and it is essential to set these out in some detail if a successful installation is to be achieved.

(i) The client who has to decide the brief for the installation. Among the factors he must consider are: The scale of service to be provided: Are all the rooms to be heated, or only selected rooms: Is full heating or background heating required: What hours of heat services will be offered—24 hours per day or during normal occupation: Will the plant be metered: Will the tenant have control of individual room temperature: How will the plant be operated and administered: And many others.

(ii) The architect who plans the development, who will have to give considerable attention to the influence of exposure, orientation, siting and composition of the development, and its influence on the energy requirement of the buildings.

He will also be instrumental in determining the detail of the building construction and standards of thermal insulation, all of which influences the final fuel requirement.

(iii) The engineer, whose first task will be to undertake a feasibility study into any proposed installation, and will subsequently design the installation.

He must offer guidance to the other parties on all factors which will have a bearing on the operating costs of the final installation.

(iv) The operating staff and associated technical and administrative supervision, who alone can maintain the plant in optimum working order.

(v) The occupant of each house who must learn to use the service intelligently, and insofar as the service is under his control, with due economy.

Having referred to the obligations of each party and their relationship to fuel consumption in the final development, let me, at this stage, discuss in more detail one of the factors which it is hoped will have been defined in the brief prepared by the client for the design team, no doubt guided by a study of the feasibility report.

(f) *Standard of heating to be provided*

To provide full heating, 24 hours per day, in all the rooms of the house, is a standard of luxury which few of us can afford.

The first point to consider is that no room is occupied 24 hours per day and that in a large development, different occupants may, due to shift working or to individual preference, make use of each room at different times.

Whilst the service may have to be offered 24 hours per day, the occupant must have control of the period he uses heat, and the amount he requires. To do this, individual control and metering of heat used must be provided to each house.

Bedrooms rarely justify full heating from a central source, as the bed itself keeps the occupant comfortable for most of the period in which he uses the room, and a choice of either a very limited background heat, or the use of an electric heater during severe weather would often be acceptable.

Background heating in the bathroom should normally be provided for comfort and towel drying.

Heating of the kitchen should not be beyond a background level because of the considerable heat gains during cooking, and the general activity of the occupants when using it.

Full heating of lounges and other public rooms should be available during occupied periods, and means provided for shutting it off or reducing the temperature at other times.

I do not propose to deal in this paper with possible economies in the other factors which go towards the final operating costs of the installation, as these points have a smaller influence on the operating costs than the factors to which I have just referred.

Let me now consider types of installation likely to be encountered and possible future developments.

You will all be aware of the various forms of electric heating, direct gas fired heating and warm air and hot water central heating, already in common use.

Each of these systems has particular advantages, and each has operating costs significantly affected by fuel prices.

Electric heating is inherently expensive in that only about 25 per cent of the heat value of the fuel used in the power stations is delivered in the form of electric power to the consumer. On the other hand, electricity is so convenient and its use so easily matched to the requirements of the occupant, that it will often be used.

Gas fired heating appliances release about 80 per cent of the heat in the fuel to the occupants, and also offer the facility of simple adjustment to the requirements of the occupant.

Central heating by warm air is thermally efficient and can be fired by any fuel, but control to meet the requirements of occupants of individual rooms is less satisfactory than other methods. It has a particular application in areas of the world where the climate is much more severe than in the United Kingdom, and where whole house heating must be provided 24 hours per day throughout the winter.

Central heating by hot water is also thermally efficient and can use any basic fuel, either in individual house installations or in larger group schemes. It is, however, somewhat less flexible than electric or direct gas firing, but many devices and controls have been developed to overcome the inherent inflexibility of a central system.

One difficulty which has not been so successfully overcome as with gas and electricity, is that it is not easy to measure, nor are the meters inexpensive.

All these systems will continue to be improved and developed and the choice in a particular development can only be made after a detailed feasibility study.

Many choices may be made without such a study, on political grounds such as ensuring continuity of work for miners, or perhaps to make life easier for the local authority by giving them no responsibility beyond the initial construction, for supplies of heat to the tenant.

I seem to have strayed somewhat from my theme—The Future of Home Heating—let me suggest some possible lines of development.

1. Undoubtedly much greater stress must be, and will be, laid on better insulation of new buildings.

However, since old buildings will not have been replaced by new buildings before the end of this century, this in itself cannot make more than a minor impact on present fuel consumption.

It is therefore important to introduce a national policy to insulate existing buildings to much higher standards, and to offer financial inducements to ensure that such a policy is implemented.

2. Nearly all warm air achieved in heating buildings is presently wasted by its replacement, often several times per hour, by natural infiltration of cold air. No attempt is made to recover the heat, but mechanically ventilated buildings can have provision for heat recovery from the exhaust system; suitable equipment for domestic sized installations has not yet been developed and marketed.

3. As an alternative to heat recovery from exhaust air, a lower standard of natural ventilation, combined with filtration of circulated air, may in the future become practical.

4. All domestic hot water used in households for baths, wash hand basins, sinks and from washing machines and dishwashers, is presently discharged to drain as hot waste.

It should not be beyond the skill of appliance manufacturers to devise a heat recovery system which could gather this heat and feed it into the make-up system serving the hot water cylinder.

Now let me turn to the next section of my paper—that of District Heating.

#### *District Heating*

You will all be aware that district heating has been successfully applied throughout Europe to large sections of cities, and on the smaller scale, to limited areas of even small towns.

In this country district heating has been less often applied, and a number of early schemes have run into economic and corrosion problems.

In Central Europe the winters are more severe than in the United Kingdom and a greater proportion of houses have always been centrally heated. The need to provide effective heating has encouraged district heating because of the economies in capital cost of plant and distribution, which are achieved by the use of larger boiler plants and because, on the larger scale, plants may be served by combined thermal/electric central stations.

Among the advantages of the larger district heating schemes are the following:

(i) Reduced air pollution arising from a smaller consumption of fuel from large high efficiency boiler-plants, and because with larger plants, it may be economic to fit grit arresting and flue gas cleaning apparatus.

(ii) The use of cheap low grade fuels rather than the expensive premium fuels necessary in small domestic installations.

(iii) A lower fire risk in individual dwellings, since no fuels are actually consumed within the houses.

(iv) National savings in fuel consumption arising from the higher thermal efficiencies of larger plant, and from thermal/electric generating stations.

(v) Absence of flues and chimneys in individual dwellings.

(vi) More flexibility to change fuel in the light of changing fuel prices and so on.

An economic case can only be made for district heating when the cost of less expensive fuel burned at higher efficiency in a central station can show substantial savings compared with the more expensive fuels burned at lower efficiencies in domestic plant. These savings in fuel cost must be sufficient to meet the capital charges, operating and administrative costs of the initially more expensive district heating system.

For any particular proposal, a detailed feasibility study is necessary to establish the capital and operating costs for district heating, and compare it with the several forms of individual heating which may be under consideration.

I have already made passing reference to the thermal/electric station, which has been used on many district heating schemes on the Continent.

In this country these have not been developed because the Electricity Boards are responsible for electric generation only, and have little wish to become involved in the problems of heat sale and distribution.

Nevertheless, there are in combined heat/electric stations opportunities for very substantial reductions in national fuel consumption.

The overall thermal efficiency of the Electricity Supply Industry expressed in terms of heat in the electricity actually delivered to consumers, compared with the heat content of the fuel burnt at the generating stations, is only about 25 per cent.

This arises not from any absence of large and efficient engineering systems in the power stations, but from the need to generate the maximum amount of electricity. To achieve the maximum power from the turbines driving the electric generators, the major portion of the heat in the steam fed to the turbines is rejected in the cooling towers which you see alongside every large power station.

If the exhaust from the turbines was not cooled so much, the heat remaining could be applied to district heating, at the expense of some portion of the electricity output, but with a very substantial increase in the overall thermal efficiency of the station.

This basic concept is applied on the thermal electric stations on the Continent and elsewhere.

It is also applied in some large industrial installations in this country where the factory complex has substantial demands for electricity and for steam for process.

You will readily appreciate that the demand for space heating varies widely with the weather, from a peak consumption in the winter to negligible consumption in the summer.

This, of course, gives rise to design problems in a combined thermal electric station, as this operates at optimum efficiency only when the ratio of electricity demand to heat demand is in a fairly constant ratio.

The problems have, however, been successfully tackled and solved on the Continent, and the increasing interest in fuel conservation will undoubtedly give rise to study of their application in this country.

There are, of course, other sources of what is presently waste heat, which can be applied in district heating.



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Such sources as exhaust heat from diesel electric generating plant and from gas turbine electric generating plant have been used, as has the waste heat from central refuse incinerator plant.

It is my view that increased fuel costs and energy storage will give rise to more detailed development of these types of plant in this country, but a lead will have to be given, as part of a national energy policy, because much investigation and research has still to be applied, and very substantial capital expenditures are involved.

Let me now turn to the final section of my paper.

#### *Building Standard Regulations—The Future*

This is indeed a daunting topic. The existing building standards represent the thinking of a very wide range of informed opinion, and to suggest that they may be less than satisfactory is perhaps a heresy.

However, the increased cost of fuel and the awareness of a world wide energy shortage change the background assumption on which the regulations were drafted and I believe they justify reconsideration of a number of standards.

First of all let us consider what standards are presently defined which are, in some way, related to fuel usage or conservation.

In Scotland, the standards of thermal insulation, to which housing and other types of residential building shall conform, are set out in the Building Standards (Scotland) Consolidation Regulations, first introduced in 1963 and subsequently published with metric units in the 1971 edition.

In many cases the standards of thermal insulation in these regulations are higher than the standards which were applied in the Model Bye-laws, which were used before the introduction of the new regulations.

In imperial units, as used in the 1963 edition and which are still more familiar to many of us of the older generation, the insulating value of a particular construction is known as the 'U' value of the structure, and is expressed in BTUs per hour, per square foot, per °F.

In metric units, the value is expressed in watts per square metre, per hour, per °C.

Comparison of the two types of units becomes more comprehensible if it is remembered that  $1 \text{ BTU/sq. ft./hour/}^\circ\text{F} = 5.7 \text{ watts/sq. m./hour/}^\circ\text{C}$ .

In my subsequent reference to insulation values, or if you prefer the technical terms, the thermal transmittance of the structure, I shall quote in imperial rather than in metric units because these are more familiar.

The regulations set the maximum permissible U values for the floor, roof, walls and glazing of the building, and also define the maximum glazed area of wall which may be used with single glazing. Where a greater area of glazing is proposed, it is mandatory to provide some, or all, of it as double glazing.

In order to assist in establishing whether a proposed construction meets the requirements of the regulations, a list of suitable alternative constructions is tabulated in an appendix to the regulations.

What then are thermal insulation standards defined in the regulations, and why were they selected.

#### *Roofs*

The regulations set a standard of  $U = 0.2 \text{ BTU/sq. ft./}$

hour/°F, compared with 0.35 permissible under the older Bye-laws. The standard is based on the degree of insulation commonly achieved by a concrete flat roof, with over roof insulation such as 4 in. foam-stay concrete, and ceiling on branders.

It is recognised that much higher standards of insulation are practical with pitched roofs, but this is not so easy to achieve with a flat concrete roof.

#### *Walls*

This regulation sets a standard of  $U = 0.3 \text{ BTU/sq. ft./hour/}^\circ\text{F}$ , equivalent to the commonly used 11 in. cavity brick wall, as this has proved reasonably satisfactory and economical. Higher standards are, however, easily achieved at little extra cost, such as by the incorporation of an inner leaf of lightweight material.

#### *Windows*

This regulation sets a standard of  $U = 1.0 \text{ BTU/sq. ft./hour/}^\circ\text{F}$  where the glazing does not exceed 17 per cent of the whole wall area, and by setting an overall value for the composite wall and window construction of  $0.42 \text{ BTU/sq. ft./hour/}^\circ\text{F}$ , requires that some or all of the windows must be double glazed where the window area is greater than 17 per cent of the wall area.

#### *Floors*

The regulations accept solid floors on ground, as reasonable, and suggest that suspended floors should have a U value not exceeding  $0.2 \text{ BTU/sq. ft./hour/}^\circ\text{F}$ .

Attention is drawn to the particular need for good insulation on floors over the open ponds or above insert balconies.

Having established the insulating standards presently required by the building regulations, let me say a few words on thermal insulation.

The first point to recognise is that it offers a number of benefits:

(a) An increase in the standard of thermal insulation reduces the amount of heat required to maintain a given ambient temperature in the building.

(b) An increase in the standard of thermal insulation raises the surface temperature on the inside of the building structure, giving rise to a higher mean radiant temperature of the surfaces, and equivalent comfort within the rooms at a lower ambient temperature.

(c) The higher internal surface temperature reduces the possibility of condensation.

A paper recently presented by Neville Billington of the I.H.V.E. showed that the savings in fuel consumption from higher standards of thermal insulation, were greater than the ratio of the reduction in heat losses from the building.

This arises because there are a number of heat gains in any building, which are substantially constant irrespective of the building fabric, and these partially offset the heat losses and consequently reduce the energy which has to be supplied by the heating systems.

In the case of housing, these heat gains consist of heat from the occupants, lighting, cooking, hot water services and electrical appliances, even including the television, together with sunshine. These can, for a typical household, amount to the equivalent of 2 kW.

If the house constructed to normal standards of thermal insulation has a heat loss equivalent to 10 kW, then the

amount of heat to be supplied by the heating system will be  $10 - 2 = 8$  kW.

If we now consider the same household to be insulated to a much higher insulating standard, so that the heat losses are reduced from 10 to 5 kW, then the heat supplied by the heating system will have reduced from 8 to 3 kW, a reduction of  $62\frac{1}{2}$  per cent in fuel consumption, instead of 50 per cent which might have been at first assumed.

A further reduction in fuel consumption also arises with the better insulated house because the incidental heat gains themselves raise the ambient temperature by a greater amount than in a poorly insulated house, so that the heating season is reduced.

Having outlined the benefits which can arise from higher standards of thermal insulation, it only remains for me to offer comment and to make suggestions on what further standards of thermal insulation should be considered when the regulations are improved.

#### *Roofs*

I suggest that the present standard  $U = 0.2$  should be reduced to 0.1 BTU/sq. ft./hour/°F.

This can readily be achieved in housing with pitched roofs by increasing the thickness of insulation between the ceiling joists, but steps have to be taken to protect any pipes and tanks in the roof space against frost damage.

For flat roofs, the lower standard can be achieved by inserting another layer of lightweight insulating material

between the roof slab and the ceiling finish.

#### *Walls*

Here I suggest that the present standard of  $U = 0.3$  should be reduced to between 0.10 and 0.15 BTU/sq. ft./hour/°F by means of insulating block in the inner leaf of the cavity wall, or by cavity insulation.

#### *Windows*

The  $U$  value of  $U = 1.0$  should be reduced to 0.5 BTU/sq. ft./hour/°F, or better by double glazing in all public rooms and kitchens and bathrooms. Whether it should also be done in bedrooms will depend on whether condensation on windows is acceptable, or if background heating is provided.

#### *Floors*

Where suspended floors are used, the  $U = 0.2$  should be reduced to 0.1 BTU/sq. ft./hour/°F or better by the incorporation of additional insulating quilts over the joists, and below the flooring.

Finally, there are great opportunities to reduce energy requirements in domestic buildings, which should certainly be introduced as a mandatory requirement in all new buildings.

As I have mentioned earlier, our older buildings will, for a long time, remain the larger part of our housing. These must be improved too. Whilst the application of insulation to older buildings is still practicable, it is less easy than in a new building. As an encouragement to the householder, some financial incentive or grant might greatly increase the number of householders prepared to make the change.

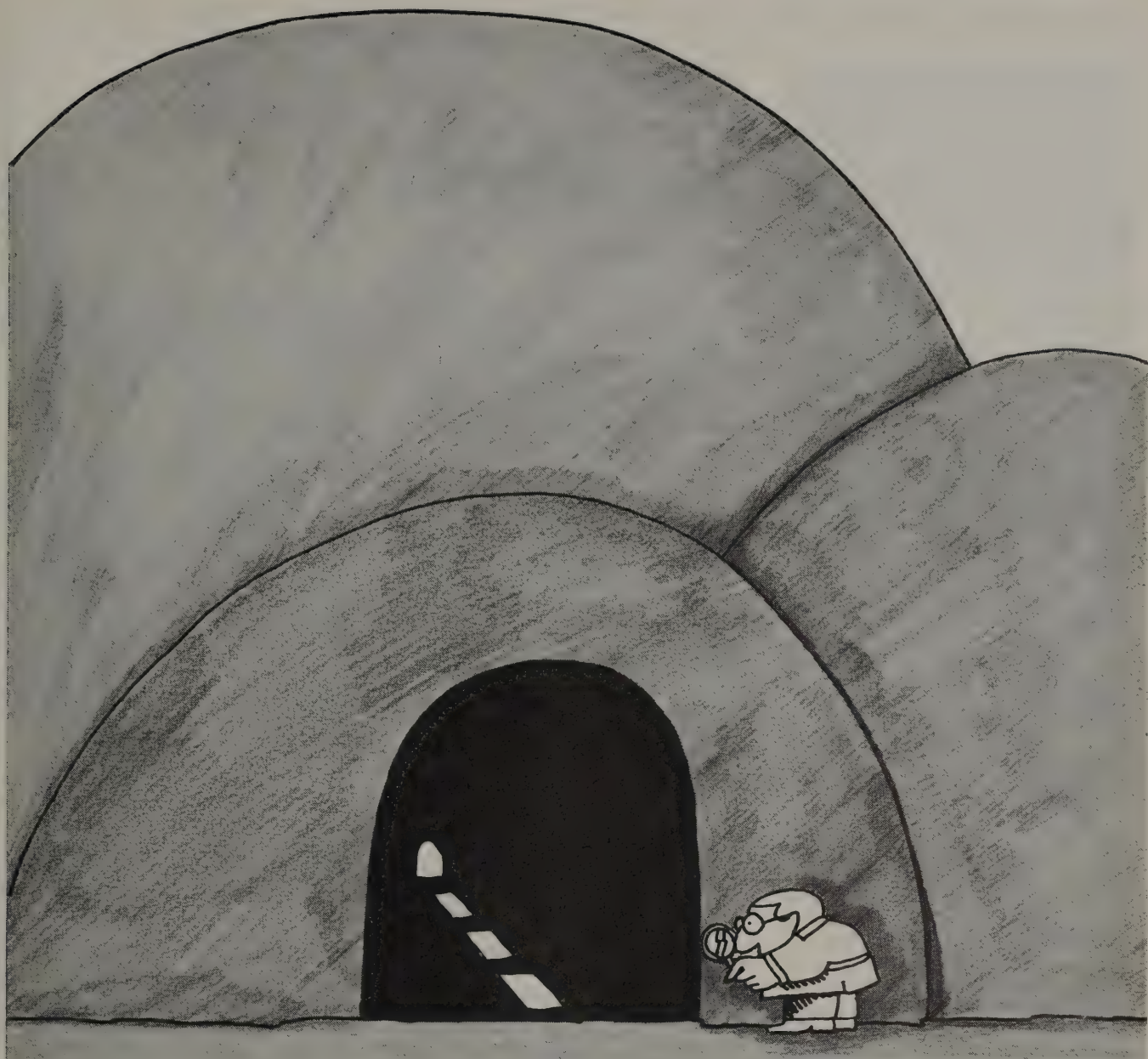
# Nailsea

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# INDUSTRIAL NEWS

## A new thermo-mechanical generator from Harwell

Harwell has invented a new thermo-mechanical generator, which will provide a highly reliable continuous source of low-power (10-500 watts) a.c. electricity, derived from propane, while requiring very infrequent fuelling. It has very few moving parts and is designed to operate for a number of years without maintenance. Three 25 watt generators have already been ordered for evaluation studies in remote areas and potential uses include marine lights, telecommunication repeaters, weather stations and under-sea systems. The new generator will be described in the July issue of the "Proceedings I.E.E." (Institution of Electrical Engineers), Vol. 121, (7), pp 749-751, in a paper by Cooke-Yarborough, Franklin, Geisow, Howlett and West.

The Harwell thermo-mechanical generator operates on the principle of the well-known but little used Stirling engine (originally patented in 1816) in which a working gas (helium) is alternately heated and cooled by being mechanically driven by a displacer to and fro between the heated and cooled ends of a cylinder; the resulting cyclical gas temperature changes lead to corresponding pressure changes in the gas, and these are made to perform useful work. In the orthodox Stirling engine—usually a machine of 10-50 h.p.—this is done by a piston driving a crank to give a rotary movement which, through a further mechanism, operates the displacer. In the much lower-powered Harwell design (illustrated diagrammatically on Fig. 1) however, movements of the gas displacer<sup>(1)</sup> are very small and rapid, and the resultant pressure changes deflect a metal diaphragm<sup>(2)</sup> which is directly linked to the armature<sup>(3)</sup> of a moving-iron a.c. generator. All these movements take place at 110 cycles per second. The gas displacer is mounted on a spring<sup>(4)</sup> attached to the body<sup>(5)</sup> of the engine and does not touch the cylinder walls, so it is free to vibrate, without sliding friction, at its natural resonant frequency; this is determined by the displacer mass and the spring stiffness.

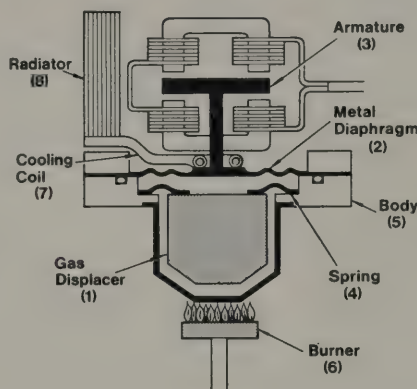


Figure 1

The displacer movement, which is maintained by the small motion of the generator body (obtained by spring-mounting the generator in its frame), fixes the frequency at which the machine operates.

The engine is self-starting, taking up its own resonant frequency when heat is applied. In normal operation the burner<sup>(6)</sup> heats the hot end of the cylinder to about 450°C while cooling coils<sup>(7)</sup> and a radiator<sup>(8)</sup> keep the cold end at about 15°C above the ambient temperature.

The overall efficiency of the propane-fuelled system in its present state of development is 8 to 10 per cent which, although low compared to a power station, is better than other systems of comparable output, whether thermo-mechanical or thermoelectric. The present machine produces 25 watts of electricity for a fuel consumption of 22 grammes of propane per hour or approximately 200 kilogrammes per year, running continuously; by comparison, a propane-fired solid state (thermo-couple) generator has 2 to 3 per cent overall efficiency and would require more than three times as much fuel, while the equivalent in the lightest available batteries would weigh 1½ tons and would need replacing annually.

There are no sliding or rotating surfaces in contact to give rise to friction, the only moving parts being the diaphragm, the armature and the displacer, all of which move freely and

require no lubrication or other maintenance. This, combined with the low fuel consumption, makes the generator particularly suitable for use on sites where access is difficult or costly, or where fuel storage capacity is restricted.

A number of prototype generators are being made by Harwell to gain field experience. One of these has been ordered by Messrs. Preece, Cardew and Rider for powering a microwave repeater in Papua, New Guinea, and two more have been ordered by the Department of Industry for the National Data Buoy which is being manufactured by the SEATEK consortium for the Institute of Oceanographic Sciences and is due to be launched early in 1975.

The Harwell machine is simple in principle and in construction and is capable of considerable further development and wider applications. Many of the features that it incorporates are the subject of patents. Reader Enquiry Service No. 7473

## Chloride Silent Power Limited

The formation of a company which will be devoted to the development and commercial exploitation of the sodium sulphur battery was announced recently by the Electricity Council and Chloride Group Limited. It will be known as Chloride Silent Power Limited.

The possibility of using the sodium sulphur couple which makes use of relatively cheap and abundant materials has been known for many years. A demonstration couple was shown by Ford Motor Company, who own the patent rights, at their Dearborn research laboratories in the U.S. in 1968, but the problems associated with its conversion from an interesting laboratory project to a commercial product have been very considerable.

Positive research on the sodium sulphur battery by the Electricity Council began in 1967 at the Electricity Council Research Centre. This research has been encouragingly successful and ECRC have produced

prototype sodium sulphur batteries using beta alumina tubes as the material for the solid electrolyte which have been successfully used to power an 18 cwt Bedford van in London and in performance tests on the roads of Cheshire.

The Electricity Council was interested in finding a suitable industrial company which would share the development effort and the cost of bringing the sodium sulphur battery to commercial reality and which had the necessary market and technical expertise and experience of launching new high quality products.

Chloride Group have successfully introduced on to the market over the years a number of new types of batteries. Recently it has become very much involved in the development of pollution free battery power for urban vehicles and in March launched Silent Rider—Britain's first full size battery bus.

The objectives of the joint operation will be:

- (a) to engage in development work over at least a four-year period to produce commercially viable pre-production sodium sulphur batteries for electric bus and commercial vehicle applications;
- (b) to develop specifications for the machinery required for bulk battery manufacture;
- (c) thereafter to licence interested manufacturers to produce sodium sulphur batteries.

It is expected that the cost of the four-year development period will be about £2 million of which the Electricity Council and Chloride will each contribute half.

If the development period is successful Chloride and the Electricity Council will consider how best to make the battery available. It is not expected that batteries will be commercially available for some years.

The sodium sulphur battery which is being developed by the new company could revolutionise urban transport. If the problems associated with its development can be overcome it will treble the range of existing battery powered buses and very considerably extend the number of light commercial vehicle applications which can benefit from pollution-free battery power.

To both applications can be added the major commercial benefit of reduced operating costs compared with internal combustion engines units,

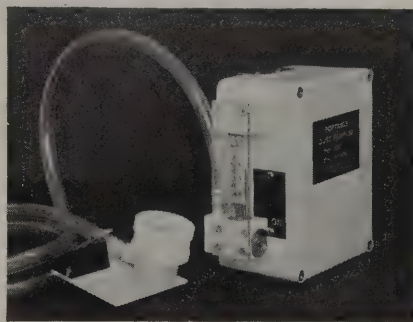
and reducing dependence on a fossil fuel resource.

It must be emphasised that this is a development project. Formidable technical problems have already been overcome in bringing the development of the sodium sulphur battery to its present state. Many problems still have to be overcome. If this can be done not only will the effect on urban transport be great but Britain will have established a commanding lead over most other countries.

Reader Enquiry Service No. 7474

#### Pocket-sized air sampler for industry

Not much bigger than a cigarette packet, the personal pocket air sampler from Rotheroe & Mitchell Limited will test for air pollution in any workshop, foundry, factory or quarry.



This model, the L2, weighing only 2 lb 7 oz, has a filter head that clips on to a jacket or overall lapel, or to a safety helmet. It enables sampling of the air within inches of the operator's face, providing a most accurate reading on the air being breathed by the worker. A pocket unit measuring only 3 11/16 in × 2 1/4 in × 4 11/16 in joined to the lapel filter by a thin polythene tube, the L2 is powered by its own rechargeable battery providing low operating costs and minimum maintenance. The rate of air flow being sampled is adjustable from 0.5 to 3.0 litres per minute and a wide range of filter papers is available for testing against dust, chemical fumes and others forms of air pollution.

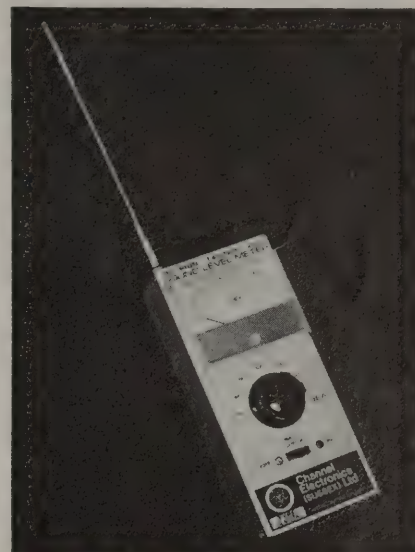
The L2, which retails at £75.00, is designed to cater for the needs of the majority of British industries and is ideal for workers in the asbestos, mining, chemical, silica and lead industries.

Reader Enquiry Service No. 7475

#### Sound level meter model SLM 77A

The SLM 77A is a light and compact unit fully complying with the Industrial Grade Specification BS 3489—1962, plus IEC 123, ANSAS.1.4. (2) and Z37. As an extremely competitive instrument all frills and unnecessary accessories have been eliminated so that the microphone, circuit and meter can be of a much higher quality than

would normally be expected on a unit in this price bracket.



Mounted on a flexible 'gooseneck' extension is an electret condenser microphone which has a good high frequency performance. To enable this performance to be realised a Field Effect Transistor (F.E.T.) is incorporated, feeding the main attenuator which has six positions and covers the range 60-130 dBA.

A tripod bush is fitted to the back of the case enabling the instrument to be used with any of the range of Channel tripods and if required an output socket can be fitted to drive a recorder. Dimensions: 177 mm × 51 mm × 76 mm (7 in × 2 in × 3 in). Weight: 1.02 Kg (2 1/4 lb).

Reader Enquiry Service No. 7476

#### New development from Nailsea

Latest development from Nailsea Engineering Co. Ltd. is a facility which permits the top removal of bags from their "Pnu-Jet" filters.

In the standard version hitherto it has been necessary to enter the bag-



housing chamber in order to inspect or change the bags—which, in most cases, is the simplest method. There are certain circumstances, however—as when, for instance, noxious or poisonous dust is present—when this is undesirable. It is here that Nailsea's new system has its application, since the operator has no need to enter a dust laden atmosphere. Each row of bags can be hoisted out of the housing by means of a simple lifting gear and any necessary adjustments effected in an unpolluted environment.

The first of these new style filters has been installed for Hargreaves Quarries Ltd. at their Skipton Rock Quarry, working in conjunction with a rotary dryer which handles 10,000 cut ft per minute of air at 150°C.

A further filter of similar design has been ordered by Hargreaves to work on a screening plant at their Layburn Quarry. It is due to be commissioned in July.

Reader Enquiry Service No. 7477

#### **Pencol/Harwell team to study wastes in Cheshire**

A joint venture team drawn from the Harwell Industrial Wastes Survey and Pencol Engineering Consultants has been commissioned to produce a comprehensive waste management plan by the new County of Cheshire.

The plan will cover all types of waste other than liquid wastes discharged to drains and sewers, and will include domestic and trade wastes, medical, surgical and veterinary wastes, wastes from industrial enterprises and from mining, quarrying and construction, radioactive wastes and farm wastes. It will also deal with problems arising from sewage sludges and derelict vehicles.

In preparing the plan, the team will collect information on the production and disposal of wastes arising in the new Cheshire area, and on the adequacy or otherwise of existing facilities for dealing with industrial waste and will make recommendations to the Council on how best to meet the needs of industry.

The work will be carried out by Pencol Engineering Consultants and the Harwell Industrial Wastes Survey Unit. Pencol is an independent firm of consultants engaging in all branches of civil, mechanical, chemical and public health engineering requiring feasibility studies, investigations, planning and design. The Harwell Unit is part of the Hazardous Materials Service, which can offer wide-ranging experience in dealing with hazardous materials and industrial wastes.

Reader Enquiry Service No. 7478

#### **Fume extraction and cleaning plant for South Africa**

An order valued at more than £500,000 has been placed with W. C. Holmes & Co. Ltd. by the Distington Engineering Company, British Steel Corporation, for three fume extraction and cleaning plants for cold de-seaming installations to work in conjunction with continuous slab casting machines. These machines are being supplied by the Distington Engineering Company as part of a development programme being carried out by them at the Vanderbijl Park and Newcastle Works of the Iron and Steel Corporation of South Africa.

Each plant comprises fume extraction ducting, a flushed electrostatic precipitator, and an induced draught fan and stack. The precipitators in each case are designed to give an outlet dust burden below 0.1 grammes per normal cubic metre of dry gas. The greater part of the construction work will be carried out in South Africa.

Reader Enquiry Service No. 7479

#### **The Beauvent G.S.C.**

F. E. Beaumont Limited have recently introduced a cyclonic device, known as the Beauvent G.S.C. (Gas Solids Collector), for removing the unburnt solids produced in oil-fired burning.

The G.S.C. which has been developed in conjunction with the British Petroleum Co. Ltd., has no moving parts, is of low capital cost, is fully insulated and with the boiler on maximum load gives a pressure loss of less than 50mm. W.G. It can be fitted into the base of any new Beauvent chimney and allows boilers to comply with the emission control standards in operation in Britain and other countries.

Several experimental G.S.Cs. were tested at B.P. Research Centre, Sunbury, and after various trials 2 prototype models were fitted to a 3,000 lb/hr. boiler. Operating at maximum load the emission was less than 0.1 per cent of the total fuel burnt, well within the maximum permissible emission of 0.4 per cent allowed under the Clean Air Act.

Approximately ten million tons of fuel oil are burnt a year in the U.K. by plant not fitted with arrestors. The Beauvent G.S.C. would enable some 20,000 tons of solids, which are normally put out into the atmosphere, to be extracted from the flue gases.

Reader Enquiry Service No. 7480

#### **ICI launch European pollution control organisation—UK and German bases for multi-million £ project**

A new pollution control organisation for companies and civic authorities in Switzerland, Germany and Austria is being introduced by ICI, the biggest chemical company in Europe.

The new organisation, ICI Pollution Control Systems, will be based in Frankfurt. Its formation follows a year's test marketing in Germany.

ICI Pollution Control Systems will concentrate initially on the fermentation, brewing and food processing industries, as well as the market for domestic sewage treatment. The group is already carrying out a major project for a carpet factory in Germany.

The full range of facilities offered will cover: the design and provision of equipment to biologically treat organic wastes; the undertaking of specialised treatment projects such as plant or process design; the sale or licensing of ICI know-how in such areas as the monitoring of toxic metals or the treatment of chemical wastes; investigatory and analytical services, including ecological and hydrographic surveys of rivers.



ICI Pollution Control Systems will offer both technical knowledge and products—the main one initially being 'Floccor', the plastics biological filter medium which ICI developed. New effluent treatment plants based on the 'Floccor' system are now being built somewhere in the world every week. Other products, either developed by ICI or acquired, are being added to the range.

The Frankfurt office is the first to be opened in Continental Europe by ICI Pollution Control Systems, which began operations in Britain last year. The German-based team will have access to a multi-discipline headquarters staff at Hyde, near Manchester, and can call on the services of almost 200 people within ICI who have specialist knowledge of pollution

problems. They are based both in the manufacturing divisions and in the company's specialist research laboratories—particularly the Brixham Laboratory, with internationally-recognised experience in the treatment and disposal of liquid wastes; the Central Toxicology Laboratory, ICI's main source of information on human and animal toxicology; and the Jealott's Hill laboratory of Plant Protection Ltd, where much important work is done to establish the behaviour of pesticides in the environment.

Because ICI (which has spent £15 million in the past three years on preventing and controlling its own pollution) has possibly unique experience in treating liquid and solids effluents, and in water management, it is in this area that Pollution Control Systems will concentrate at first. Britain has a technological lead over most other European countries in effluent treatment techniques.

"It has been forecast that the cost of water will treble by 1980 in Germany and the UK", says Dr. R. F. Neale, manager (industrial) of ICI Paints Division's Hyde Group, when he announced the formation of the German branch of ICI Pollution Control Systems at the Pro Aqua, Pro Vita Exhibition in Basel on 11 June. "This figure will be higher if we do not substantially improve our methods of water management and effluent treatment."

In France only 8 per cent of the population are served by effluent treatment facilities, and in Italy the figure is 5 per cent, Germany 44 per cent and the UK 80 per cent.

"Facts like this, and our own very extensive market research carried out with ICI's Europa Division in Brussels, confirm that the market for pollution control equipment and know-how will grow strongly in the future," Dr. Neale says.

ICI Pollution Control Systems aims to achieve a multi-million pound turnover by the end of the decade. "Although Switzerland, Germany and Austria are prime targets in continental Europe, we intend to operate elsewhere too," says Mr. T. R. Roxby, ICI Pollution Control Systems. "We will do this initially through ICI's selling companies or through sales agents in each European territory, and we intend to develop the service by adding new products, by acquiring specialist companies in Europe, and by opening further ICI Pollution Control Systems offices in other key countries."

Reader Enquiry Service No. 7481

### Trans-atlantic link for coal research

Agreement has been reached between European and North American—United States and Canada—coal producers for the setting up of an international committee for coal research.

The committee's aim will be to facilitate the co-ordination of the research programmes of the member industries and encourage dissemination of results essential for the rational application of financial resources. It would cover mining techniques, safety and coal utilisation and conversion.

The agreement was reached in Brussels at a meeting of representatives of the U.S. Government and coal industry, led by Mr. Carl Bagge, President of the National Coal Association, and delegates from the Association for Coal in Europe (Britain, Belgium, Germany, France and Spain), led by Dr. Erwin Anderheggen, Chairman of the European coal producers' technical research committee. Canada was represented through her High Commission in London.

British representatives on the Committee are Mr. Leslie Grainger, NCB Board member for Science, Dr. Joseph Gibson, Director of the NCB Coal Research Establishment, Cheltenham, and Mr. Peter Tregelles, Director of the NCB Mining Research and Development Establishment, Burton-on-Trent.

Dr. Anderheggen said a major task for the Committee would be to identify and examine research objectives and technical results with the aim of enabling coal to make a larger contribution to world energy needs.

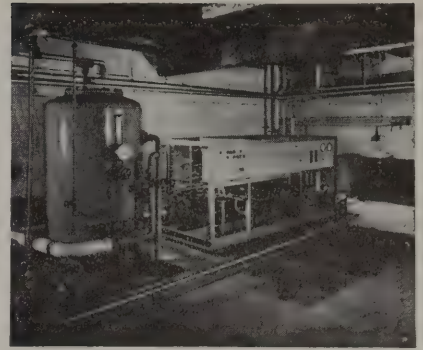
Mr. Bagge stressed the great importance of this new initiative in international co-operation at a time when the world's need for coal was greater than ever.

The Committee has nominated topics for discussion at the Second International Coal Research Conference, to be organised by the National Coal Board in London on 8-9 October, 1974. Representatives from Australia and South Africa will also be invited.

Reader Enquiry Service No. 7482

### New reverse osmosis plant installed

A 113,500 litre per day reverse osmosis plant for production of high quality boiler feed water has been installed by a major British dry cleaning and textile manufacturing firm to



improve quality, cut costs, and eliminate most of the waste disposal problems encountered with an earlier lime soda softening unit.

Located at the Basford works of Sketchley Textiles Ltd., the reverse osmosis unit uses a dozen Du Pont "Permasep" permeators to reduce the total dissolved solids (TDS) of its well water from 715 parts per million to about 85 ppm before it is fed to the plant's low-pressure boilers. That practically eliminates costly scale build-up in the heating system and prolongs the life and operability of the plumbing valves and other fixtures.

The low TDS of the reverse osmosis water reduced the plant's boiler blow-down from 30 per cent to about 5 per cent, Sketchley engineers report, on the basis of more than 3,600 hours operation. That, of course, results in lower boiler feed water requirements and less waste water discharge.

Designed and installed by Paterson Candy International Ltd., the reverse osmosis unit requires less than 4.5 m<sup>2</sup> of valuable floor space on the Sketchley plant and operates virtually unattended five days a week. The lime soda softening unit which it replaced required several times that floor space and, in addition, created large amounts of magnesium hydroxide and calcium carbonate which constituted a waste disposal problem. Concentrated salt solution from the permeators in the new unit can be disposed of satisfactorily through the plant's existing sewage system. The reverse osmosis unit also eliminated chemical storage space and handling equipment that had been required for the lime soda softener.

The complete water treatment system at the Sketchley plant includes an air-scoured sand filter to remove suspended solids ahead of the reverse osmosis unit. Chemical treatment at the RO unit consists of phosphate to prevent scaling of the modules. Caustic soda and polyphosphate also are added to the permeate water to adjust to pH and control any residual hardness.

Each of the "Permasep" permeators in the Sketchley installation measures only 120 cm long by 14 cm in diameter, but contains nearly a million hollow fibres about the size of a human hair which act much like a molecular filter. When brackish water is circulated around the fibres under pressures of about 24 kg/cm<sup>2</sup>, the pure water molecules permeate or pass through the wall of each fibre and flow down the hollow bore to be collected at the end of the permeator as a product stream. About 90 per cent of the dissolved solids in the brackish water, too large to pass easily through the fibre walls, are continuously flushed out of the permeator as a waste or reject stream.

Reader Enquiry Service No. 7483

#### **New AAF 'Enercon' energy conservation air conditioning unit**

'Enercon' units reclaim the heat which is normally extracted from areas where heat is excessive, and transfer it by means of a closed water loop to areas where heat is deficient. The heat reclamation principle offers the lowest possible power consumption, and thereby achieves extremely low operating cost.

Enercon provides an individual climate control system, which can be built up unit-by-unit. It is particularly suitable for large office blocks, hotels, multi-room buildings and applications where the comfort requirements are diverse. The units are virtually silent in operation, and offer a wide variation in heating/cooling capacity.

The basic requirement for an Enercon system consists of an evaporative closed circuit water cooling tower, a supplementary water heater, a pump and closed loop water circuit to which the units are connected. These units are available in two configurations to suit the design or function of the building—(a) vertical 'Console' units complete with an exterior casing suitable for floor mounting, and (b) horizontal units for concealed installation (such as in ceiling spaces), utilizing supply and return air ductwork.

In the Console configuration five models are available, with cooling capacities ranging from 5,800 to 17,200 BTU/hr. Corresponding heating duties range from 6,500 to 31,400 BTU/hr. In the horizontal concealed range seven equipment sizes offer cooling capacities from 8,300 to 53,500 BTU/hr., and heating capacities from 9,500 to 81,300 BTU/hr.

Each basic unit is complete with filter, integral refrigeration system, and reversing valve which is thermostatically controlled to determine whether the system operates on heating or cooling. Quiet-operating air circulating fans, water coil and condensate connection are included in the specification. In the case of the Console model, the exterior casing is available in any one of eight colours.

A number of optional accessories are available, including a variety of filter types to suit the operating conditions, and hose kits which permit easy chassis withdrawal for maintenance purposes.

Reader Enquiry Service No. 7484

#### **The Harold Bate Auto-gas Converter**

A new low-cost system enabling motorists to select either petrol or gas—even whilst driving—has been introduced by Harold Bate Auto-Gas Converters Ltd., of Altrincham.

The system is based on a control unit which automatically admits gas into the carburettor according to engine requirements. Electrically operated valves control the supply of either petrol or gas to the engine. Change to either fuel is by a single dashboard switch.

The system is designed to operate on all types of gas—butane, propane, natural and town gas, and methane. The maximum energy is obtained from methane which is not derived from oil and is available from natural U.K. resources. Plans are understood to be advanced for the large-scale U.K. production of this gas. It is therefore claimed that the system enables the motorist to exploit whatever fuel is most economic—and available.

Driving procedure is exactly the same with gas as it is on petrol. Gas is automatically switched off whenever the engine stops and this eliminates the danger of a build-up of gas beneath the bonnet.

Tests have shown that performance in terms of acceleration and top speed on gas is virtually the same as on petrol and, in many cases, significantly improved. Exhaust pollution is practically eliminated. This cleanliness also reduces oil contamination which gives less engine wear.

Costs per mile depend on the gas used and the quantity in which it is purchased. They are approximately the same on propane as with petrol for the private motorist buying commercially available, easily handled

canisters. Bulk purchase of course gives tremendous economies.

The control unit costs £19.75 + V.A.T. and a complete installation costs approximately £40. This includes a garage fitting charge, although the D.I.Y. motorist will find the fitting instructions easy to follow. No parts have to be changed and the car need be off the road for little more than an hour. The unit is extremely compact, measuring 150 mm. (6 in.) in height and 100 mm. (4 in.) in diameter.

The installation enables motorists to break their complete dependency on petrol costs and availability, being able to select their fuel by—literally—the flick of a switch.

It is based on original work by Mr. Harold Bate of Devon, who has been running his own car for more than ten years on methane produced from farm waste. The development has aroused worldwide interest—from lecture tours of America to presentation on Japanese television.

The manufacturing contract has been placed with Sidney Russell & Sons Ltd., of Walsall, who have been suppliers to the motor industry for over 100 years. Manufacture is also being established in America where anti-pollution requirements are increasing in severity making the pure burning qualities of gas of very considerable importance.

The vehicle installation is only a small part of the work by these companies in the energy field. Production of digesters is a few months away. These will enable industrial, agricultural and community organisations to generate methane from waste, and it is possible that a domestic unit will eventually become available. In many cases it will be possible to eliminate fuel running costs.

Reader Enquiry Service No. 7485

#### **Exhaust analyser measures pollution, indicates engine efficiency**

An infra-red exhaust analyser, calibrated to measure pollutant emissions specified by the stringent Californian regulations, and hence to meet the needs of legislation now being introduced in Britain, is announced by Link-Hampson Ltd.

Apart from covering present and future legal requirements, the analyser offers the most direct indication of engine efficiency, by measuring two residual constituents of the exhaust gas—carbon monoxide and hydrocarbons—resulting from incomplete

combustion. It can therefore be used to detect the majority of common faults associated with the carburation and ignition systems, as part of a diagnostic test and tune-up procedure. The unit is completely portable and powered by the vehicle's own 12 volt supply.



In the Link model 4094 analyser exhaust gases are drawn by pump through a probe inserted into the vehicle tailpipe, and passed through a particulate filter and water separator. The carbon monoxide and hydrocarbon contents are measured simultaneously, using lead selenide detectors and multi-layer infra-red filters; dual-range meters allow for the increasingly strict pollutant limits which are anticipated in the next few years.

An accuracy of plus or minus 0.25 per cent carbon monoxide and plus or minus 20 parts per million of hydrocarbons is guaranteed, with rapid response and a drift of less than 1 per cent of full scale per hour after warm-up. Optical calibration eliminates the need for standard gases and the warm-up period is said to be less than two minutes.

The analyser measures 12 in  $\times$  11½ in  $\times$  29 in high, with a 16½ foot pick-up hose, and weighs 20 lb. Trade price is £650.00 plus VAT. Reader Enquiry Service No. 7486

#### Honeywell projects advance search for viable solar energy systems

The search for a viable system to harness solar energy and use it as a substitute for existing energy sources is taking a further step forward through two development projects currently being undertaken by Honeywell's Systems and Research centre. The projects are a solar energy heating system in a Minneapolis school,

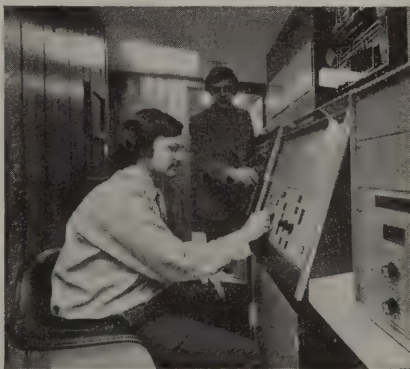
and a mobile solar energy research laboratory. Both have attracted grants from America's National Science Foundation.

Honeywell recently completed installation of an experimental solar heating system in North View Junior High School, Minneapolis. The system is expected to produce some 1,320 million BTUs per year—6.3 per cent of the school's annual heat usage, or the equivalent of 12,500 gallons of oil per year.

At the heart of North View School's system is a 5,000-square-foot solar collector system made up of 36 in by 96 in collector units mounted on structural frames in an open area next to the school's playground. Each six-inch-thick solar collector consists of tempered glass, a layer of translucent plastic, two absorber plates (which absorb the sun's thermal energy and between them a water-glycol mixture is circulated), a layer of insulation, and a metal outer frame.

After the water-glycol solution in the collector system is heated to between 130° and 150°F, it is transferred to heat exchangers in the school's existing heating system, to heat return air from the school building, or water for shower, lavatory or kitchen areas.

The Honeywell Systems and Research centre's mobile solar energy research laboratory project has also recently reached its field test period. Prime objectives of the laboratory are to collect climatic data to be used in the design of integrated solar heating and cooling systems, and to carry out practical tests on the application of heating and cooling systems to buildings.



The laboratory consists of two units. A 45-foot trailer houses the solar heating and cooling test equipment and a complete weather station. A 50-foot 'office' van represents the building to be heated, cooled and supplied with hot water by sun power.

It will also be used for on-tour solar energy briefings and discussions.

The laboratory's energy collection system is made up of 650 square feet of solar panel collectors, similar to those installed at North View School.

During an extensive test period, the laboratory will be operated by Honeywell in a number of different climatic regions across North America. During the first weeks, essentially a field shakedown, only the solar heating equipment and related instruments are aboard. Later this summer, the vehicles will have two advanced solar energy air conditioning systems added to the existing equipment. The laboratory will then take to the road again for comparative experimental and testing activities.

Honeywell initiated design of the laboratory and began its construction. A National Science Foundation grant included a share of the design and construction work, and supports the operation of the laboratory in its research and data collection tasks. Reader Enquiry Service No. 7487

#### Swedish company brings to Scotland technique for oil storage in underground rock caverns

Svenska Vag A.B.—a member of the Axel Johnson Group—have opened an office in Glasgow primarily to serve the needs of the North Sea oil industry in the UK. The company are one of the largest contractors in Sweden and are among the world's leading specialists in the storage of oil in unlined rock caverns—a technique which they pioneered. It has now become standard practice in Sweden, where a large number of such caverns have been made, storing vast quantities of oil, and a number of others are at present under construction.

Many parts of the UK have rock formations equally suitable for oil storage—and with the growing importance of adequate facilities for the storage of both crude oil and oil products, the system is arousing increasing interest in the UK.

Underground storage of oil offers many advantages compared to conventional storage in surface tanks. As the oil is surrounded and retained by hydrostatic groundwater pressure, the risk of its leaking out and causing contamination is eliminated. The requirement for surface land is radically reduced, compared with conventional tank farms. If the method is chosen at an early stage, while sites are still being evaluated, the area of land

acquired can be correspondingly smaller; if the land has already been purchased, a much larger part of it can be set aside for further development. Underground storage may indeed be the only solution where land availability is restricted—in Sweden underground storage has been built under existing installations such as industrial plants, roads, housing and even under existing surface tanks.

In operation, the method also has advantages—particularly at the tanker terminals, where the level of a conventional tank farm is always higher than that of the tanker, while with underground storage it is below sea level—which considerably speeds unloading.

Risks of fire and pollution are greatly reduced—so much so that in Sweden the insurance companies quote substantially reduced premiums compared with surface installations and damage to the landscape is minimised in areas where environmental considerations are important—a fact which may have particular value in many areas of Scotland.

The method also offers substantial economies in cost. As a result of the development of new rock blasting techniques, the cost of excavation has remained unchanged for many years in spite of inflation. Given good rock conditions construction costs of an underground installation, including equipment, are lower than those of surface tankage when the oil storage exceeds 30,000 cubic metres.

The most significant saving is, however, in operating costs—not only on insurance already mentioned, but in factors such as reduced heating costs, reduced evaporation losses and reduced maintenance.

The underground storage system takes advantage of the fact that oil is lighter than water and does not mix with it. Oil stored in a rock cavern—which must be located well below the groundwater table—is retained here because the groundwater in the surrounding rock exerts a pressure at all points greater than the hydrostatic pressure of the oil stored. The inward pressure gradient causes a continuous minor flow of groundwater into the cavern. As a result of the difference in densities this water collects under the oil in the bottom of the cavern from where it is pumped out. In general the water-bed is maintained at a fixed depth of about 0.2 m.

In principle, the cavern may be of any shape. The object being to excavate a cavity of required volume—given suitable geotechnical conditions—at a minimum cost. The excavated rock may then be sold or utilized for filling purposes.

The installation includes pumps and piping for product handling and removal of groundwater seeping into the cavern.

To maintain low viscosity heavy fuel oils and some grades of crude oil require heating. In such cases, heating is effected by circulating oil and bedwater through heat exchangers

and redistributing it through special piping through the cavern. The low thermal conductivity of the surrounding rock ensures a low level of heat loss. After the first year of operation, when the surrounding rock has been heated, the heating requirement is decreased, thus effecting an economy in the installation.

An underground oil storage installation is usually remote-controlled, being supervised from a central control room. The control panel comprises pump controls and instrumentations showing and controlling product and water levels, temperature indicator, volume meter, etc.

As the geology of a prospective site is a prime consideration, a project must always be initiated by carrying out a geological survey. This is aimed at providing data to serve as a basis for decisions regarding the overall suitability of the site, cavern location and configuration and the necessity for rock supports or for grouting and groundwater conditions.

Seismic investigations by the measurement of the propagation rate of a detonation wave and the reflection at interfaces between different strata make it possible to record and evaluate the condition of various earth and rock strata.

Such a seismic investigation should be complemented with a number of boreholes which are driven to probe possible zones of weakness.

Reader Enquiry Service No. 7488

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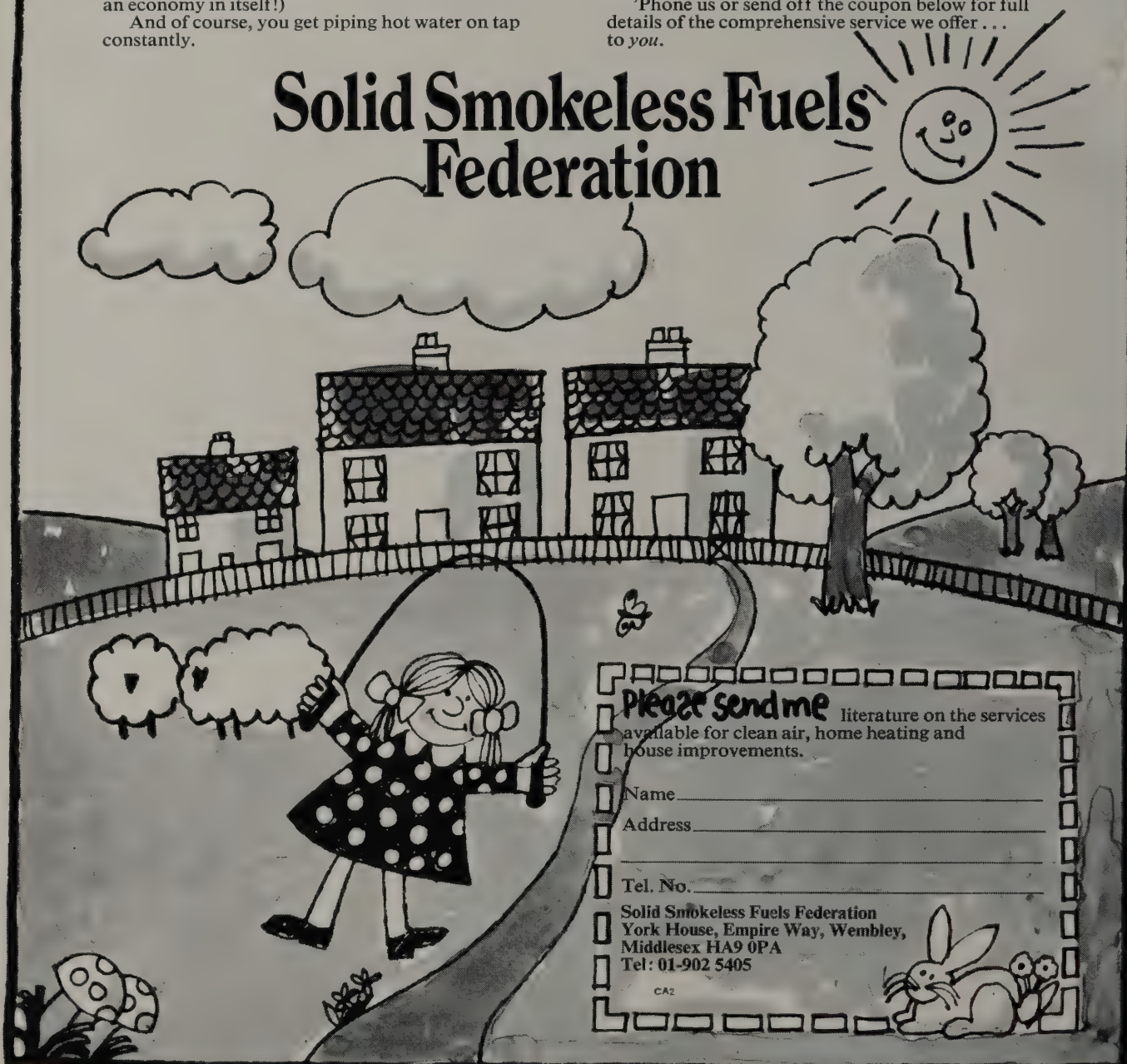
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# **CLEAN AIR**

*Incorporating "Smokeless Air"*

**WINTER 1974**

**VOL. 4 NO. 16**

## **PRINCIPAL CONTENTS**

**Cardiff Conference**

**Opening Address, Councillor A. Huish,  
J.P., Lord Mayor of Cardiff**

**Presidential Address,  
H. B. Greenborough**

**A Fully Integrated Mobile Laboratory  
for Monitoring Ambient Air Quality,  
D. T. Tomi, R. J. Batstone,  
E. B. Winn, D. H. Slater**

**The Control of Pollution Act in Relation  
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## THE JOURNAL OF THE NATIONAL SOCIETY FOR CLEAN AIR

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# CLEAN AIR

## The End of Black and White

Ever since the Beaver Report of 1954, local authorities have been described as "black" or "white" for smoke control purposes. The aim of this designation was to indicate, in broad terms, the nearly four hundred local authorities where it was thought that there was the greatest need to introduce domestic smoke control. However, the Secretary of State for the Environment and the Secretary of State for Wales now consider that progress under the Clean Air Act 1956, particularly in many of the so called "black" areas, has caused the original designation to become out-of-date. Indeed there may now be a greater need for smoke control in some of the original "white" areas than in those much improved "black" ones where imaginative smoke control programmes have achieved so much.

The Secretaries of State have therefore decided, on the advice of the Clean Air Council, to take the opportunity afforded by local government reorganisation to make changes in the procedures for smoke control orders.

As from 23rd September, 1974 the classification of "black" and "white" areas has been abolished, and there will be no distinction between areas for smoke control purposes. Each area will be assessed on its merits. As the Circular (DOE 131/74; Welsh Office 206/74) states "The Secretaries of State and the Clean Air Council will still need to assess progress in smoke control and to make financial estimates for future grant commitments. They will, therefore, need to have a realistic definition for those areas where smoke control is desirable". It is recognised that local authorities themselves are in the best position to weigh up local conditions and it is for them to take the initiative and institute smoke control orders; and all local authorities are urged to review the progress made by their predecessors and themselves and to determine what further parts of their area should be subject to smoke control and how soon this can be achieved. In this respect it is clear that the Department of the Environment expect that almost all the former "black" areas will be considered to be areas "that should at some stage have smoke control and that a substantial number of "white" areas will also be regarded."

All councils have been asked to send a statement to the Department of the Environment or the Welsh Office as appropriate, giving the present state of smoke control in the areas for which they are now responsible, and to send a similar statement in May each year until the programme is effectively completed. The hope is expressed that "all areas of need" will be subject to smoke control within a reasonable period, and "the Secretaries of State and the Clean Air Council still consider it would be helpful if those authorities who have not yet drawn up programmes now did so."

The Circular does, however, express a note of caution: "The current severe economic climate means that progress in this area should be limited to what is possible within existing resources, with offsetting savings being found elsewhere."

No one would argue that domestic smoke control has been and is completely worthwhile. It has proved to be the greatest single factor in cleaning our air; and although, like everything else these days, it costs money, for what it has achieved and is still achieving, it has been and is comparatively inexpensive. It is to be hoped therefore, that the changes outlined above will result in renewed impetus being given to the smoke control programme throughout the country and that it will be possible for the necessary money to be found "within existing resources".

We welcome the changes announced by the Secretaries of State, we are glad to see the demise of the "black" and "white" authorities—and this is reflected in the new way in which smoke control progress is reported later in this journal. And, we sincerely hope that it will not be too long—and we should now remember that it is eighteen years since the Clean Air Act became law—before there are no grey areas left.

# CARDIFF CONFERENCE

The decision to hold the 1974 Clean Air Conference in Cardiff was possibly a departure from tradition in that Cardiff is not usually regarded as a resort or a conference town. Nevertheless, it will be a surprise to many people, but not to all, to learn that a Clean Air Conference was held in Cardiff as long ago as 1938.

However, in 1974 it was agreed that the conference should be held in Wales, that the theme of the conference should deal with industry and so Cardiff was a "natural". Although a few delegates were disappointed that the conference was not being held at a seaside resort as such, the very good attendance at the conference showed that most delegates, at any rate, attend for the conference rather than the place. In the event Cardiff coped very well with the large influx and the conference was extremely successful.

The papers presented were not only particularly appropriate to the time and place, but were of a high standard. As a consequence, all sessions were extremely well attended and there was always a high level of discussion.

The pattern of opening the conference on the Monday evening was continued and the Assembly room at the City Hall was comfortably full to hear the welcome and Opening Address from the Lord Mayor of Cardiff, Councillor Albert Huish, J.P. and the second Presidential Address from Mr. H. B. Greenborough.

Mr. David Gibson-Watt, the former Minister of State at the Welsh Office, was unable to open the conference as previously arranged, and the Lord Mayor of Cardiff very kindly and competently took his place. The Lord Mayor's Opening Address is reproduced later in this journal, as is the Presidential Address by Mr. Greenborough.

On the morning of Tuesday, 15th October, the venue was moved to the New Theatre where new legislation was discussed following a very clear exposition by Mr. W. Bate, M.B.E., the City Environmental Health Officer of Cardiff. On the Tuesday afternoon, the first of four sessions on Environmental Pollution was held, when Dr. Roland Jenkins of B.P. Chemicals International Ltd.,



*Clean Air for the Lord Mayor*

*Left to right: Mr. J. Clancey, O.B.E., The Lord Mayor, Miss Mary George, C.B.E., Rear Admiral P. G. Sharp and Mr. R. A. W. Hollingdale*

gave an extremely interesting and informative paper on the technical aspects of co-operation between industry and local authority. On Wednesday, the theme of Environmental Pollution was continued when road traffic was considered. Mr. T. W. Heppell of the Building Research Establishment not only presented a very interesting paper but gave a very informative and fascinating demonstration of traffic noise and its control. Dr. H. N. Stewart, of Warren Spring Laboratory, talked of the preliminary findings of the Five Town Survey and made particular reference to the work being carried out in Cardiff, a few hundred yards from the place where he was speaking.

On the Thursday morning, industry again came back into the picture when Mr. David Broadbent of the National Coal Board presented a paper about the coal industry and Dr. A. O'Connor of the British Steel Corporation pulled no punches at all when he presented the facts about the difficulties of the control of pollution with which the steel industry was faced. In the afternoon, the theme of Environmental Pollution was continued, but Professor Kenneth Mellanby of the National Environmental Research Council moved away from industry in particular and gave a very fine talk about wild life and the effects of pollution. This was an open session and the attendance from school children and students from the South Wales area was very large indeed, and President Mellanby had a very enthusiastic audience.



*Professor Mellanby addresses the Open Session*

The last session of conference was held on the Friday morning when the measurement of heavy metals in the atmosphere was discussed by two speakers. Mr. N. J. Pattenden, an Atmospheric Physicist from the Environmental and Medical Sciences Division of AERE Harwell, discussed methods of sampling and some of the elementary principles involved; he was followed by Professor G. T. Goodman of Chelsea College, the University of London, who said that his students described him as a "cowshed chemist". Professor Goodman gave a very interesting paper on the use of moss-bags as deposit gauges for airborne metals.

The weather in Cardiff followed the pattern of the autumn experienced all over the country this year and so was not very good, although it was only on the last



*Some of the schoolchildren attending the Open Session*

day that really heavy rain interfered and made things uncomfortable. On the Wednesday afternoon there were no less than six different technical visits, as well as a tour of the Brecon Beacons for those more socially inclined. Concurrently with this, the Solid Smokeless Fuel's annual Golf Competition was held at Radyr and a few delegates played tennis.

There was a full programme for the ladies who, after a demonstration of cookery and a fashion display on the Tuesday morning, visited the Wye Valley. On Thursday there was a visit to the Welsh Folk Museum at St. Fagans and some ladies visited the new Hypermarket at Caerphilly.

Of the technical visits, possibly that to Oakdale Colliery was the highlight. Twenty delegates who were fortunate enough to draw "horses" in the ballot, set off at 13.30 and did not return until late in the evening. They spent over four hours underground and really got down to the coal face. The National Coal Board made very detailed arrangements for the visit and the size and shape of every member of the party had been notified in advance, so that protective clothing of the proper size was available on arrival. Suitably attired, the party then made their way underground and, as can be seen from the photographs, it was soon difficult to distinguish the visitors from the real miners! Needless to say the latter were extremely friendly, helpful and informative, and it is understood that they enjoyed the visit as much as the visitors. Unfortunately, because of an error in staff work, the visitors had not been warned to take towels with them and so were not able to avail themselves of the baths when they emerged on the surface after their sojourn below ground. In consequence they took their grime back with them to their hotels in Cardiff—but were none the worse for this. This technical visit was described by one participant as "first rate" and by another as "the best technical visit I have ever been on". Our thanks are due to the National Coal Board and the staff at Oakdale Colliery for arranging such a worthwhile technical visit.

The steel industry was not neglected and a party of 35 delegates visited the BSC plant at Llanwern, and a similar party went to the works at Port Talbot. The party for Llanwern was welcomed by the Special Projects



*Mr. Draper takes the chair at Session 3*

Manager who gave a brief description of the plant and accompanied the delegates on a coach tour which lasted approximately two hours. He explained that the works, which first began production in 1962, was a fully integrated works originally designed to produce 1,400,000 tons of steel; its capacity was now 3,500,000 tons. It was the first steel works in the world to rely entirely on basic oxygen steel making and the first with automatic charging of the blast furnaces. The works had also done much of the pioneer work in the industry in relation to computer controls. It provides 40% of Britain's motor industry with its sheet steel requirements and also had a large export trade including exports to Detroit.

The party was first taken to a tall tower adjoining the ore stock yard, from which there was a good panoramic view of the whole works, which is built upon low level marsh. The guide referred to low level pollution which arose from fine ore blowing from the stock yard and measures which were being taken by both spraying and in relation to the method of storage to reduce nuisance from this source. The party then passed the sinter plant on its way to the coke ovens, both of which are a prolific source of nuisance. Emissions are controlled at the sinter plant by means of electrostatic precipitation. Nuisance can arise at the coke ovens both at time of charging the ovens, discharging and quenching. Some of this nuisance is extremely difficult to control and steps were, therefore, being taken at the new coke ovens, in course of construction, to provide total enclosure with stainless steel cladding at a very high cost. The two blast furnaces provided at the plant had outputs of approximately 2,500 tons a day. A new blast furnace, which at the time of the visit, was nearing completion, is designed for the production of approximately 6,000 tons per day.

The visit continued with a drive past the rolling mills, soaking pits, the hot strip mill, the pickle lines and the cold mill and terminated with light refreshments and a brief period for question and answer. Thanks were expressed to the Management by Mr. Redston, Chief Environmental Health Officer for Bath City. All delegates attending this visit were impressed with the measures taken to minimise pollution which was, of course, to be expected in a works, the construction of which was started after the passing of the Clean Air Act, 1956.

At Port Talbot, Mr. Vincent Thomas ("it's the furnace that smells—the air is quite clean really"), Assistant Information Officer, more than lived up to his designation, as he gave an impressive commentary of facts and figures about the works during a packed two-hour tour.

Port Talbot is an integrated works taking in iron ore and finally producing rolls of steel sheet. Up to four years ago, ore was landed at the Old Marghan Wharf but this was limited to ships of not more than 10,000 tons capacity, and so in 1970, a new harbour which was opened by H.M. the Queen, came into use. A depth of water of not less than 31 feet is now available at all states of the tide.

Some 2 million tons of ore—from America, Canada and Sweden—are imported annually; these are all significantly richer in iron than native ones. Two grabs, each 22½ tons capacity, are employed to carry out unloading and the ore is taken by conveyor to the stockyard where piles of distinctive colours were evident. All ore bigger than 4in is crushed. Material between ¾in and 1in goes to the blast furnace, while material less than ¾in being too small to go direct to the blast furnace, goes to the sinter plant, where it passes under an intense flame which burns out the carbon, after which the particles agglomerate. The present sinter plant, dealing with 45,000 tons of material per week, has four chimneys and these are being replaced by one 150m high stack.

From the bus, delegates saw one of the five blast furnaces being 'tapped' and the molten metal run into a 300-ton torpedo ladle for transport to the converters, one of which was seen in action from the observation gallery. First, a large scoop discharged some 90 tons of scrap into the furnace and this was followed by the molten metal from the transfer ladle. The charge is enriched with oil and oxygen and eventually run off into ingots varying from 9-24 tons. These were seen on trains waiting to go to the hot rolling mills which are, in total, a mile long and through which the ingots are successively reduced to plate which is finally discharged in rolls at the end of the process.

The plant needs 30,000 tons of coke per week, which calls for 45,000 tons of coke per week to pass through the coke ovens. The coking coal is mainly imported so that a regular product is obtained.

Members of the party were naturally interested in measures to reduce pollution and information on this was given by Mr. Ron Evans, Pollution Control Officer and his assistant Mr. K. Donnan. Pollution can arise at all stages—dust from unloading and stockpiling, iron particles and smoke from sintering, gases, iron oxide and steam from the blast furnaces, smoke and steam from coke ovens, and fine iron particles and fumes from the steel process. The fumes from the converters are handled by high energy scrubbers which reduce the burden to 0.05 grains/cubic foot. Without the various arrestment equipment, up to 50,000 tons of dust per year would possibly be emitted.

The visit had, of necessity, to be kept on the move to enable the visitors to see even a part of a works 4½ miles long × ¾-mile wide and all credit is due to Mr. Thomas and his helpers for their capable handling of the visit and all the information given in the time. In addition to Mr. Thomas, Mr. Evans and Mr. Donnan, the party was also accompanied by Mr. C. Davies and Mr. D. Brown. The Society is grateful to all of them and to the British Steel Corporation for the opportunity to visit this works.



*Miss George presents the Golf Cup*



*Civic Reception*



*The Lady Mayoress and Miss Mary George, C.B.E.*



*Baroness White, The President and The Lord Mayor*



*An Attentive Audience*



*Technical Visit to Oakdale Colliery*

A party of 36 delegates visited the industrial waste disposal plant of Re-Chem International Ltd. at Pontypool. The plant was specially designed to accept a wide range of solid and liquid waste for neutralisation, detoxification and disposal; either by controlled incineration or by chemical treatment followed by solid waste disposal. Where economically practicable, metals and other elements were extracted for re-sale. The energy requirements of the plant were met from the wastes themselves. There was keen interest among the delegates, many of whom were from local authorities facing additional responsibilities for waste disposal under the Control of Pollution Act. Their many questions on the technical and economic aspects of the plant were freely answered by the management and operating staff, although the plant is run as a private commercial venture. A sincere vote of thanks was expressed to the Re-Chem staff at the end of a most interesting and instructive visit.

A few delegates elected to stay in Cardiff and two small parties visited Dominion House at Queen Street where Warren Spring Laboratory, helped by the Health Department of the City of Cardiff, were carrying out measurements of pollution from road traffic as part of the Five Towns Survey. Queen Street is a main road passing through the busy shopping and commercial area of the City centre. The instrument accommodation is on the second floor of Dominion House with the mast on the street, half a metre from the kerb, with the sampling gear facing east. The instruments which run continuously, record the total hydrocarbons, carbon monoxide

and lead particulates. The results are given as monthly summaries showing the Mean Daily Mean, Maximum Daily Mean and Maximum Hourly Mean. In addition, traffic count, wind speed and wind direction are recorded at the site. This illustrates the relationship between the rate of traffic flow and pollutants. Considerable interest was shown by delegates in this sampling site, which is one of five taking part in this survey. The other sites are in London, Glasgow, Birmingham and Cambridge.

Finally, 35 delegates visited the Baglan Bay complex of B.P. Chemicals International Ltd. at Port Talbot. On the Tuesday morning they had heard of the problems and the manner in which they had been tackled in the paper given by Dr. Jenkins. On the Wednesday afternoon those delegates who went to Baglan Bay were given a most interesting and informative tour of the works, where they could see for themselves what the problems were and how they were being tackled.

The Solid Smokeless Fuel Federation Golf Cup was contested at the Radyr Course, which the competitors thought was quite tough. The cup was won by Councillor George Moore of Rotherham District Council with a score of 31 points, which was reckoned quite a good one for the day. It was also good enough to beat his friend and fellow Councillor, Charles Brett, also from Rotherham, who was second. Not only did Councillor Moore win the cup and the commemorative tankard, but also a cardigan and the sweep money—to say nothing of quite a few side bets from other players who, it is understood, were previously his friends!

Unfortunately, because of the small number of participants, it was not possible to award the Gas Corporation Cup for tennis this year. This was particularly disappointing as in previous years the tournament has attracted many entries. The usual enjoyable squash-for-the-few also suffered this year, but hopefully will be organised in 1975 as in previous years. The tennis tournament, too, will be organised again in Brighton in 1975 and it is hoped that there will be a good turn out. Would-be players should bear in mind that the main purpose of this tournament is friendly recreation rather than fierce competition and anything too vigorous.

There was a warm welcome to Wales for the ladies, despite the disappointing weather. On Tuesday, Wales Gas Home Service gave a delightful demonstration of traditional Welsh cookery, followed by a display of suits and dresses in Welsh tweeds and flannel. These were elegantly modelled by the girls on the staff of N.S.C.A. Some 80 ladies attended.

On Tuesday afternoon, a party of 50 ladies enjoyed a coach tour of the Wye Valley. It was unfortunate that some of the scenery was obscured by 'Welsh Mist' but it was agreed by all that the countryside that could be seen was well worth the trip. The tour was broken at the Beaufort Hotel, Tintern, for tea and in the time available to them, several people were able to wander around the beautiful and historic Tintern Abbey.

Wednesday was a dull, damp day and despite careful planning, the coaches arrived late. However, two coaches with 70 people left for Brecon, and drove steadily uphill through the mining valleys and Merthyr Tydfil. It was noticed how much cleaner the valleys have become and how much has been done to remove towering pit heaps, especially round Aberfan. Reaching the top of the pass over the Beacons, the scenery suddenly changed from industry to beautiful wild uplands. Bracken and winter grass were tawny-coloured and every watercourse a torrent after the rain. Brecon was reached in time for tea at the old Castle Hotel, where there was an enjoyable view over the river Usk to the Beacons. Just in time, for the clouds then descended, giving a long wet drive back. Regretfully, due to the late start, it was not possible to explore Brecon as fully as was hoped.

Thursday morning was fresh and sunny for the visit to St. Fagan's Folk Museum, a name belying the charm and interest waiting. Leaving the noise and bustle of today, one stepped back into a quiet Welsh village. Farmhouses, cottages, a chapel and a smithy were linked by lanes and surrounded by trees and sheep cropped turf. The buildings have been so lovingly reconstructed that it was impossible to believe that they came from all over Wales. Log fires blazed in the open hearths and each house contained furniture, china and utensils of the age when it was built. One quite expected to meet the former owners at any moment! A brief visit was made to St. Fagan's Castle, a Tudor house set in glorious gardens and finally the museum buildings, displaying all aspects of Welsh town and country life—a very pleasant morning indeed.

It will be seen from the above that the time at Cardiff was busy. But in spite of this, the social programme was by no means neglected. The President gave a small dinner on the Monday evening; on Tuesday, the Lord Mayor and Lady Mayoress and the Corporation of Cardiff gave a Civic Reception for all delegates and their wives at the City Hall, and on Thursday the members of the Council of the Society were entertained at a Civic Luncheon in Cardiff Castle. The Castle was also the venue for the reception given by the Chairman of the Society's Council on the Thursday evening. Various other organisations also arranged receptions and entertainment for delegates and their wives, and the Society is grateful to them for so doing.

There was no conference dinner this year. Support for this function has fallen off in recent years and the Council decided, on the recommendation of the Conference Committee, that the dinner should be discontinued this year. Some delegates were obviously disappointed, and said so; and there is no doubt that this decision did leave a gap, which was not entirely filled by all the other activities. But if a dinner is to be held in future, evidence of support for it will be needed. We hope it will be forthcoming.

From all that has been heard, there is no doubt that those who went to Cardiff considered it to be one of the best conferences the Society has held.

## CALLS FOR PAPERS

**Second International Symposium on Ozone Technology, Sheraton Mount Royal Hotel, Montreal, Canada, May 11-14, 1975.**

Papers are now being solicited for the Second International Symposium on Ozone Technology, to be held in Montreal, Canada.

Although the major theme of the Second International Symposium will continue to be Ozone for Water & Waste-water Treatment, we are soliciting papers in other related fields of ozone technology, such as: Ozone Generation, Analytical Chemistry of Ozone, Air Treatment, Industrial & Municipal Deodorizing, Atmospheric Ozone Studies, etc.

Abstracts of 300-500 words should be submitted in triplicate to The Symposium Chairman at 101 Headquarters, 24 Central Ave., Waterbury, by February 1, 1975.

**Dust Control and Air Cleaning Exhibition and Conference, Olympia, London, September 16-19, 1975.**

Papers are invited on innovations and developments which show how dust control and air cleaning equipment and techniques serve the world's most important industries, utilities and services. Preference will be given to papers demonstrating cost reductions, productivity improvements and profit optimisation.

Abstracts giving the title and a 100 word summary should be sent as soon as possible to:

The Organisers, Dust Control and Air Cleaning Exhibition and Conference, c/o Technology and Exhibitions Ltd., 1 Katherine Street, Croydon CRG 1LB.

# CARDIFF CONFERENCE

## Opening Address

by

The Right Worshipful, The Lord Mayor of Cardiff  
Councillor A. Huish, J.P.



Mr President, Ladies and Gentlemen, as Lord Mayor I welcome you as delegates to this very important Conference. I can assure you that as Lord Mayor, I have never before had the opportunity of opening a Conference so late in the evening; but you are indeed sincerely welcome.

The Society used to be known as the National Smoke Abatement Society from 1929 until 1958, when it adopted its new title two years after the passing of the Clean Air Act, in the bringing of which to the Statute Book the Society played a great part. Prior to 1929, it was the Coal Smoke Abatement Society, which had been formed in 1899. It is evident from the proceedings of the Conference that during this passage of time the Society's interests have extended beyond mere coal smoke to other forms of air pollution. It is of interest to me that you will be discussing noise as an air pollutant. I subscribe to the findings of the Royal Commission but this is a serious and growing problem.

However there are forms of pollution, other than air pollution, as witnessed by the extent of the Control of Pollution Act. This legislation will impose great responsibility on Local Authorities, their members and officers, and on those responsible for running the nation's industry and commerce. There will be a clear need for these three sides to exchange information and to work together. Such is the record of your Society that I am prompted to forget that the recent further extension of the scope of the Society is most timely.

I learn that the Conference of the Society has visited various places since 1929. In 1938 it was in Cardiff and in 1958, in Llandudno. This hardly seems a fair advertisement having regard to all we have to offer in our city! Indeed many of you will be visiting the capital city of Wales for the first time, and you will be here for one week. It is my sincere wish that you will not only enjoy the surroundings of our city but also enjoy the friendship that you may find here. It is therefore, my very, very pleasant duty to welcome you to our city.

I know that the discussions you are going to have this week are going to have a very serious affect not only upon the people of Wales but indeed upon the whole world.

Recently, I attended an International Conference in Dresden, in E. Germany, and there resolutions were accepted affecting the world's population and the problems of pollution. When we returned home, these recommendations were accepted by many of our authorities. As a member of the health committee of this city for something like 20 years I have been interested and closely associated with the important research work that has gone into pollution. I must say that we in this city, and indeed we in this country and all our colleagues all over the world are deeply indebted to all those who feel it their duty to promoting the research into all forms of pollution that is affecting world society today.

It therefore gives me very great pleasure as Lord Mayor of this city to open your Conference with a sincere hope that it will be a successful and enjoyable one.

# CARDIFF CONFERENCE

## Presidential Address

by

H. B. Greenborough

My Lord Mayor, ladies and gentlemen. First of all may I thank you, my Lord Mayor, for honouring us by agreeing to open this conference and for the very kind welcome you have given us. Some of us have had the privilege of dining with you and have had first-hand experience of the warmth of your personal welcome and we have greatly appreciated the open and frank interchange you have managed to pack into an hour when we tried to discuss many of the basic problems which affect these islands today. Cardiff is a fine city and I hope that the delegates will find the time during this conference to explore some of its beauties. You will notice that Wednesday afternoon has been kept not only for a series of technical visits but, for those who wish to take their own sample of the fresh air of this city, for a golf tournament and a tennis tournament.

Ladies and gentlemen, may I also welcome you all again to the Annual Conference of the National Society for Clean Air. Once more this year we have a wide range of subjects in the programme, which serves to emphasise that concern about air pollution is shared among many interests in this country today. We shall be hearing in the next few days how those involved in such diverse fields as Government, Industry, Transport and Wild Life are reacting to environmental problems and co-operating with each other to attain reasonable solutions. Although more immediate anxieties, such as inflation and the economic situation, may be in the forefront of the public's consciousness, there is no doubt that environmental questions, and pollution in particular, are still of great concern to many people, and we must see that they remain so.

Much has been achieved in recent years in the campaign towards cleaner air. Further successes in smoke control orders were achieved last year, maintaining the impetus from the "vintage" year of 1972, while the new range of solid fuel "smoke-eater" appliances is now widely available. Their use should go a long way towards helping reduce smoke in the domestic sector. Nevertheless, there are still many areas outside our major conurbations where there are high concentrations of smoke and an obvious need for a smoke control programme. The original distinction between "black" and "white" areas is now generally accepted as having served its purpose, and there may be a more urgent need at this stage for controls in some of the original "white" areas. In these circumstances, we should be encouraging every local authority to examine its own situation more critically.

It may surprise you to recall that it is now twenty years since the publication of the Beaver Report on Air Pollution, from which the 1956 Clean Air Act and the now-familiar system of domestic smoke control stemmed. A number of members who worked with the Committee are still active in air pollution circles, and they must look

back on their work with a sense of pride and achievement. The widespread acceptance of their recommendations by local authorities in the major industrial towns has led to some 70% of all premises in the original "black" areas being covered by smoke control orders today.

In April of this year, the new local authority structure for England and Wales came into effect, and Scotland will follow in 1975. This Society has been very active in re-structuring itself to meet the new situation. The change meant that all the previous local authority representatives of the Society ceased to be members at the end of March, and recruiting had to be started afresh with the new authorities. The response has been good so far, and we hope that every local authority in the country will join or re-join as soon as possible and support the aims of the Society.

When I spoke to the Conference last year, the theme of my address was the future of the world's energy resources, and I mentioned then that, while there was reason for confidence on the supply front, we must reconcile ourselves to an era of higher energy costs. Since then, considerable increases have occurred in the prices of fuels and there has been much talk of the need for conservation measures as both the industrialist and private consumer have faced increased fuel bills, and as the country's balance of payments has reflected the increased costs of oil imports.

While I will be returning to this aspect later on, I should like to concentrate rather more today on the theme of industry and its attitude to the environment. Before doing so, however, I should refer to recent developments in the sphere of legislation, since the past year in the UK has been notable for a number of measures and announcements affecting the environment.

At legislative level, we now have on the Statute Book two important Acts, dealing with the Control of Pollution and Health and Safety at Work. I have already mentioned the Clean Air Acts and their impact on domestic smoke control, but Environmental Health Officers also have powers under this legislation to enforce regulations against dark smoke and control emissions to the atmosphere from industrial premises which are not registered under the Alkali Act. To these already extensive and effective powers, the Control of Pollution Act has additionally given to local authorities the means to enforce any regulations regarding the composition of motor fuel and sulphur content of fuel oil, and also to obtain and publish information about emissions to the atmosphere from all non-domestic premises in their areas. The Act also provides local authorities with extensive powers for the control of certain kinds of noise, and also the facility to introduce noise abatement zones. Such work will bring Environmental Health Officers and their staffs into even closer consultation with local industrial interests, and may well stimulate further public

interest. We may thus be assured that the monitoring and control of pollution will remain an important aspect of local authority activity for many years to come.

Whilst this progress in legislation is welcome, we must recognise the problems facing some local authorities with a difficult financial position and also a national deficiency in the number of public health inspectors. It may be that these economic and staffing problems may defer progress on some of these matters for several years, if only because some local authorities may not be in a position to allocate the necessary time and money in today's conditions.

The Health and Safety at Work Act, which also became law this summer, is the instrument whereby it is proposed that the various individual specialist Government inspectorates will be amalgamated into one overall authority—the Health and Safety Commission and Executive. The Executive includes both the Alkali and Factory Inspectorates, among others, but links with other Government Departments and local authorities will obviously remain. As a result of this Act, incidentally, the Alkali Act which has been on the Statute Book in one form or another for 112 years and which has done much for clean air in this country, will be repealed. Before this Act passes into limbo it is as well to remind ourselves how long is the history of environmental action in this country. Throughout this period, there has been built up a tradition of co-operation between Government, local authorities and industry which has been of inestimable value and which we must not lose, no matter what institutional changes are imposed on the system.

Though many of the details of the new organisation have yet to be worked out, it is intended to build on the existing expertise by effecting closer co-operation between different bodies engaged in similar work. It is to be hoped, however, that the Alkali Inspectorate, which has a fine record of achievement, will retain its identity within the new Health and Safety Executive.

It is encouraging to know that the philosophy of "the best practicable means" will be retained in the new regulations. While it has been subject to some criticism lately, it does enable account to be taken of current technology, using the co-operation of the interested parties. The proof of any pudding is in the eating, and there can be no doubt that this doctrine has achieved effective results over the hundred years of its operation.

The Royal Commission on Environmental Pollution, now reconstituted under the Chairmanship of Sir Brian Flowers, began its work by conducting a review of the whole field of pollution, from which it was apparent that there is no shortage of areas for further study. Those of you who heard Sir Brian Flowers' address to the Society in July will remember that his scope of interest ranged from problems of noise and litter to industrial waste and water pollution. Of particular interest to us is the request from the Secretary of State for the Environment to the Commission to undertake a review of the whole system of air pollution control, for completion by next summer. Such an enquiry is expected to cover the relationship between central control and local initiative, between industrial costs and social benefits, and between the public at large and authorities in general. We shall follow the progress of the review with considerable interest.

Concern over the environment is increasingly becoming an international matter, and it is, therefore, fitting for me to mention a couple of recent developments outside our shores concerning air pollution. The Stockholm Conference of 1972, of course, provided the incentive for many countries to review their own programmes, and a United Nations Environmental Programme has now been established, under which priorities have been assigned for the global monitoring of pollutants. On a European level, it is now over a year since the Council of Ministers approved a comprehensive action programme of plans to combat pollution of the environment in the EEC, and steady progress is being made on its implementation. As with the United Nations programme, a high priority is being given to the study of air pollutants, and draft directives are currently being considered on the lead content of petrol and sulphur content of gas oils.

Ladies and gentlemen, it is only four years since European Conservation Year 1970 focused the attention of us all on the problems of environmental conservation. Although industry in this country has since then come in for considerable criticism (often uninformed) from both the press and the public on environmental issues, I believe that this audience at least would accept that the evidence shows that industry, has, in general, a responsible attitude towards pollution problems. Of course, there are differences between industries and between companies, and there is no cause for complacency. Larger enterprises are perhaps better able to devote resources to environmental improvements by virtue of their size, and most major potential polluters acknowledge the need to co-operate fully in reducing their impact to a reasonable level.

If, however, one looks back to European Conservation Year 1970, one cannot fail to be disturbed by the fundamental change in people's expectations that events have forced on them in this brief space of four years. The problem of pollution and the environment was seen then as a problem of prosperity—how could we reconcile the continuing economic growth desired by the overwhelming majority of people with the avoidance of irreparable harm to the natural environment? While there were, and still are, those who questioned the desirability of further economic growth and who forecast the exhaustion in the near future of many of the world's essential mineral resources, the general expectation was of increased prosperity and a higher standard of living for all. Indeed, it was only through continuing economic growth that a way could be seen of improving the lot of the deprived sections of the community, whether in the developed or the developing countries.

How different is the situation today! Today the question is no longer whether further economic growth is desirable—it is whether it is in any way attainable in the foreseeable future. Beset by a world-wide epidemic of inflation, by threats of world-wide recession, by fears for the stability of the international monetary system, even by fears for the future of parliamentary democracy itself, people in the developed countries can no longer maintain, in the near future at least, optimistic hopes or rising expectations. For most people the question is how can they cling on to the standard of living which they already have during the next few years. For the developing countries, the situation is, of course, verging on the catastrophic.

It would be outside the scope of this address for me to go into detail as to the reasons for this sudden and grave deterioration in the world's economic prospects. But one of the main reasons has been the enormous increase in the cost of energy and, particularly, oil. It should be noted that this has been brought about, not because of any immediate prospect of the exhaustion of the world's oil resources, but because of political and economic action dictated by the oil-producing countries. Indeed, the immediate effect has been to reduce oil consumption and delay by many years the date when oil production reaches its peak. OECD forecasts for Europe, the USA and Japan indicate that overall consumption in 1980 will be little, if any, higher than in 1973. However, the results of the increases in oil prices have been to give a savage upward twist to the inflationary spiral, to create severe balance of payments problems in the rest of the world and to put the international monetary system under great strain.

What then will be the effect of these recent developments on the relationship between industry and the environment? At the time of last winter's emergency, fears were expressed that anxiety to secure energy supplies might lead to some slackening in environmental programmes throughout the world. While it is true that there have been postponements and re-assessments of some measures, particularly in the United States, the overall impact was slight.

In this we can count ourselves fortunate. However, you may have seen in the press today, a statement to the effect that in order to bring about significant reductions in oil demand in the U.S.A., President Ford is trying to move through Congress a Bill that promotes coal substitution for oil, and I quote—"Backed up by drastic relaxation of environmental protection against air pollution and strip mining and by tolerance of large environmental damage," and this, ladies and gentleman, is an example of the problems to be faced under extreme environmental pressures.

In this country, the most publicised move was the deferment of the agreed voluntary programme for the reduction of the lead content in petrol, which was estimated to save 2% of total annual consumption. The maximum permitted level will now be lowered from 0.64 to 0.55 grammes per litre from 1st November instead of last January, with a further review of the situation scheduled for next year. It is prudent to ensure that lead levels in the atmosphere do not increase, and the agreed programme of phased reductions in the lead content of petrol was designed to prevent this happening. As I was personally very much involved in this exercise, I would like to cite this as an example of voluntary collaboration between interested parties. The phased and voluntary reduction programme for lead in petrol was brought about by long and quite hotly debated reviews of the situation that took place between Government, the motor industry and the oil industry. At the end of the day we were able to set down what was an acceptable programme to all parties concerned; one that certainly satisfied the Medical Research Council in as much that we did not add to the environmental hazards of lead in the atmosphere; one that was phased in a way that was not going to bring too onerous a burden on the consumer in terms of increased price or put too much of a burden on industry, both manufacturers and oil, at a time when capital stringency was utmost in their minds. A very good example of what can happen when people

are able to engage in a meeting of minds objectively, and bring about reasonable solutions to difficult problems. At the same time, it must be appreciated that there are increasing costs involved in lowering the lead limit, both in terms of additional imports (it is estimated that the latest reduction will add £30m on to our annual import bill), and in extra capital investment at refineries. Such costs escalate sharply once a limit of around 0.4 grammes per litre has been reached, which is the current EEC target for 1976.

But the real cause for concern relates to the effect of the current economic situation on future environmental improvements. Most of industry is caught between the nether and upper millstones of rapidly-rising costs and controlled selling prices. The resultant squeeze on profit margins is leading to cash-flow problems and thus to severe reductions in capital investment. In a struggle for survival, the concentration will inevitably be on what is essential rather than on what is even highly desirable.

I would not wish to be misunderstood. Responsible companies, and they form by far the greater part of industry, will conform to legislation on pollution in the same way as they obey any other part of the law of the land. But beyond this, the pace of further progress in environmental improvements must inevitably be affected by the current economic climate. The relationship between industrial costs and social benefits will require to be examined even more critically than in the past, and in this context it should be remembered that it is the consumer who has ultimately to bear this expenditure. All this seems to me to point to the need for even closer co-operation between Government, local authorities, industry and all those, such as this Society, who are concerned with the environment, so as to ensure that such progress as is practicable can continue to be made.

I mentioned briefly earlier in my address the question of energy conservation and I have referred to the forecast effect on future consumption of higher oil prices. If the energy problems of the past year have had any virtues they must surely have been in reminding people of true value of the world's fossil fuel resources. Supply difficulties and higher prices have forced the world to think again about its wasteful and extravagant use of these valuable resources. The conservation of fuel means less pollution as well as a saving in costs.

In the United Kingdom, the Secretary of State for Energy pointed out last June that a reduction of £600 million, much of it payable in foreign currency, was possible if the country's current energy consumption was reduced by 10 per cent. Certainly, there has been no lack of publicity on this theme, and industry and domestic consumers have already responded to the new economic facts of life by some considerable savings so far this year. However, the extent to which such results may be improved, or even maintained, without a more fundamental re-appraisal of our attitudes, must be open to question. Energy conservation needs to be thought of not only in terms of the most efficient use of fuel but also in terms of its overall effectiveness. A highly-refined oil, for instance, can be burned very efficiently in large boilers, but other less-refined products can be used just as well and, at the same time, save the better-quality product for use in processes where there are no suitable alternatives. Opportunities, of course, exist to improve efficiency at individual plant level by better maintenance of equipment.

A number of different bodies, both in Government circles and outside, have been addressing themselves to different aspects of the energy conservation issue. The task will be no easy one, but success will lead to both economic and environmental gains.

Ladies and gentlemen, the picture which I have painted has been somewhat sombre. I do not, however, despair of the future. Given the will, and goodwill, we

can get through our present difficulties. There is an increasingly-widespread understanding of the problems facing us and I am confident that this country still has the reserves of skill, of courage and common-sense to enable us to overcome our problems and, furthermore, that we can do this without, in the process, sacrificing hard-won improvements to our quality of life. After all, we are proven exponents of the philosophy of the best practicable means.

# INTERNATIONAL CLEAN AIR AND POLLUTION CONTROL CONFERENCE

incorporating the 42nd ANNUAL CLEAN AIR CONFERENCE

20th—24th OCTOBER 1975

BRIGHTON

Monday October 20th	20.30	Opening Session (Formal)
Tuesday October 21st	10.00	<b>International Attitudes to the Control of Pollution</b>
	1.	A Comparison of Approaches. (U.K.)
	2.	The U.K. Approach and its Application
		(a) By central government (U.K.)
		(b) By local government (U.K.)
	3.	Europe—The EEC Philosophy of Control (EEC)
	14.30	
	4.	Europe—The EEC Approach to Medical Standards (EEC)
	5.	A New Approach to Standard (Netherlands)
Wednesday October 22nd	09.30	<b>Energy from the Continental Shelf</b> (International/U.K.)
	6.	Geology and Exploration
	7.	Procurement
	8.	The Future
Thursday October 23rd	10.00	<b>Technical Aspects of Control of Industrial Pollution</b>
	9.	Gaseous Emissions (France)
	10.	Effluents (W. Germany)
	11.	Solid and Toxic Wastes (U.K.)
	14.30	<b>Conservation of Resources</b>
	12.	Human Resources (U.S.A.)
	13.	Energy and Raw Materials (U.K.)
Friday October 24th	09.30	<b>Pollution from Road Vehicles</b>
	14.	Europe—The EEC Philosophy of Control (EEC)
	15.	Technical Problems of Control (U.K.)
	16.	Noise and its Control (U.K.)
	12.00	Closing Address

# A Fully Integrated Mobile Laboratory For Monitoring Ambient Air Quality

by

D. T. Tomi, R. J. Batstone, E. B. Winn and D. H. Slater



Figure 1

## Introduction

A mobile ambient air monitoring facility with integral data logger has been designed and commissioned for a comprehensive baseline survey of the Teesside area on behalf of Phillips Petroleum Company, operators for the Phillips Norway Group.

The ambient air survey will extend over a 12-month period prior to the commissioning of the on-shore crude oil stabilisation, storage and ship loading facilities at Seal Sands and Greatham. This is part of an overall environmental survey which also includes an investigation of the hydrology, biology and chemistry of the Tees Estuary and Tees Bay.

For an overall assessment of the ambient air quality at Teesside, the mobile laboratory will operate at selected sampling sites on the boundary of the two Phillips sites, at adjacent industrial and residential locations and on the rural periphery of the Teesside area. Four continuous hydrocarbon monitors have been located at fixed sampling sites at Greatham, and continuous sulphur dioxide monitors at Greatham and Seal Sands.

## Monitoring instruments

The major objective of the study is to establish the ambient air quality within and around the Phillips Petroleum sites at Seal Sands and Greatham to serve as a scientific assessment of the pre-operational baseline conditions.

Most of the information on ambient air quality in the U.K. is in the form of long-term mean concentrations and has been obtained mainly for sulphur dioxide ( $\text{SO}_2$ ) and smoke measurements at the Warren Springs Laboratory's national survey sites. In addition to  $\text{SO}_2$  and smoke, measurements of other air pollution variables are needed to assess air quality in the region of industrial conurbations. Variables of particular relevance include hydrocarbons (HC) (as methane, total, non-methane, and specific), nitrogen oxides ( $\text{NO}_x$ ) and photochemical oxidants ( $\text{O}_3$ ). Data on the combustion derived pollutant, carbon monoxide (CO) and total suspended particulates (TSP), as well as an analysis of the particulate composition, may also need to be assessed. For the specific purposes of this study, variables which are being monitored include:  $\text{SO}_2$ , total, specific and non-methane HC, NO and  $\text{NO}_2$ ,  $\text{O}_3$ , CO and TSP.

The Teesside area is a complex array of industrial sites spread over a large area and the Phillips Petroleum Company site, far from being a single isolated source which can be monitored individually, is within a multiple source pollutant dispersion pattern. Therefore, to simplify interpretation of the monitored data, a method of source evaluation is necessary, requiring the measurement of the meteorological parameters: wind speed, wind direction, temperature and humidity. To complete the environmental quality assessment, noise levels are also recorded. The necessary flexibility for this study is achieved by operating the monitors in a mobile laboratory.

Correlation of air pollution variables requires that the measurements should have compatible resolution characteristics, in terms of range (sensitivity), time constants (speed of response) and sampling frequency. Currently available instrumentation is discussed fully in the literature (1-5) and a choice of instrumentation was made on the basis of sensitivity, specificity, reliability and acceptance to regulatory authorities, such as the United States Environmental Protection Agency.

Both the correlation requirement and the need to obtain instantaneous concentration data as distinct from long-term averages, meant that only continuous monitors were considered acceptable, not the classical "wet" chemical batch methods. A proven record of reliability, robustness and long-term stability was an important prerequisite. Table 1 outlines the essential features of the selected instrumentation, which are shown in figure 2.

### Design of sampling system

The essential feature of the sampling system is that the integrity of the sample is maintained through to the instrument, so that an instrument reading accurately reflects the ambient levels. To achieve this, ambient air at 95 litres/sec. is drawn through a 76 mm removable Kynar duct which extends 0.9 m above the roof of the van. Kynar is a fluoro plastic which is effectively inert to the pollutants measured and the 0.9 m extension is chosen to penetrate the boundary layer thickness around the van. The induced draft fan, which is connected to the sampling duct, is located in the rear dropwell of the van and exhausts through the gas cylinder compartment to provide forced ventilation for this compartment.

Air samples are drawn from the sampling ports along the duct through Teflon tubing to the HC, SO<sub>2</sub>, NO<sub>x</sub> and O<sub>3</sub> monitors (each of which is provided with an individual

TABLE 1  
*Specification of Monitoring Instruments*

<i>Parameter Measured</i>	<i>Method</i>	<i>Range</i>	<i>Sensitivity</i>	<i>Calibrations/Zero</i>
Total* Hydrocarbons	Hydrogen flame ionisation detector (FID)	Four manually switched 1/10/100/1000 ppm (minimum 0-1 ppm CH <sub>4</sub> )	0.01 ppm as CH <sub>4</sub>	Hydrocarbon free air as zero gas. Bottled mixture of hydrocarbons for calibration.
Sulphur Dioxide	Electro-chemical (coulometric principle)	0-1 ppm	0.004 ppm	Internally by standard SO <sub>2</sub> source.
Ozone	U.V. absorption	0-3 ppm	0.001 ppm	Internal electronic (External calibration also available).
Nitrogen Oxides	Chemiluminescence	Six switched 0-0.05/10 ppm NO and NO <sub>2</sub> + NO	0.001 ppm	N <sub>2</sub> as zero gas, mixture of Nitric Oxide in N <sub>2</sub> as calibration gas.
Wind direction	Windvane (mounted on 6m extendable mast)	0-540° with auto 360° switching at range extremities	2°	Pre-calibrated.
Wind speed	Anemometer (mounted with wind vane)	0-25 m/s	0.25 m/s	Pre-calibrated
Noise levels	Weatherproof condenser microphone (mounted on 5m extendable mast)	Dynamic range 50dBA Available range 40dBA-130dBA	±1dBA (microphone system) ±1.5dBA meter channel overall	Internal 90dBA signal.
Temperature	Bi-metallic strip	20°-100°C	1°C	External calibration required.
Humidity	Hygroscopic skin membrane	20-100% RH	2% R.H.	External calibration required.
Total suspended particulates	High volume sampler Fibreglass or paper filter	Variable Sample period	—	—

\* Specific methane and non-methane hydrocarbons and carbon monoxide are also obtained for diagnostic purposes but not on a continuous basis.

Hydrogen and air are supplied to the HC and NO<sub>x</sub> monitors from two pairs of gas cylinders located in a separate compartment at the rear of the van. Direct high pressure regulation is provided on each bottle with low pressure controls and gas filter assembly panel mounted inside the van. Bottled calibration and zero gas mixtures are mounted on racks beside the instrument frame and are connected via corrosion resistant regulators and four-way sample valves to the HC and NO<sub>x</sub> monitors.

sampling pump). Combustion gases from the instruments are collected in an exhaust manifold, located below the hood of the instrument rack and are discharged beneath the chassis to prevent contamination at the sampling duct. This system also provides adequate ventilation of the interior working space, in which the air volume is changed three times per hour.

The wind speed and direction and noise sensors are mounted on telescopic retractable masts which may be

operated by either a small 24V DC electric compressor or by pressure regulated compressed air, and extended to a height of about 5 metres above roof level.

#### Data acquisition system

To facilitate reduction, retrieval and future interpretation of information from the seven continuous monitors, an automatic data acquisition, reduction and recording system is obviously required. Various possible recording systems were examined including: (a) separate or multi-channel continuous analogue strip chart recorders; (b) time averaged multi-channel strip chart recording; and (c) continuous and time averaged data recorded digitally. Clearly only the last alternative can provide data in a format which can be easily retrieved and further processed (eg as multi-parameter correlations, input to mathematical models, data retrieval, etc).

From a statistical analysis of air pollution data (6) it is apparent that the maximum and minimum concentrations obtained from averaging readings over a period of three minutes are almost identical to the instantaneous extreme values. To reduce data storage requirements it is therefore quite sufficient to record the three-minute mean values.

In the mobile laboratory the time averaged three-minute mean values are computed and recorded on magnetic tape cassette for HC, SO<sub>2</sub>, NO<sub>x</sub>, NO, O<sub>3</sub>, wind speed and direction. In order to characterise adequately the monitored noise levels over a three-minute interval, the following parameters are evaluated:

- The maximum noise level during the period ( $L_{max}$ ).
- The noise level exceeded 90% of the time ( $L_{90}$ )—"the background noise level"; and
- An "equivalent" noise level ( $L_{eq}$ ), which is the statistically averaged energy mean noise level.

$$L_{eq} = 10 \log (0.01 \sum_i f_i 10^{0.1L_i})$$

where  $L_i$  = characteristic noise level in dBA of a 3dBA interval class  $i$

and  $f_i$  = percentage of noise level measurements in class  $i$

The central control and processing unit of the data logger is a microcomputer. This unit controls the scanning procedure, whereby each instrument output (or channel) is sampled, normalised and digitised. All signals except those from the noise and wind direction monitors are stored in accumulators. When the 180 measurements are taken per channel (during a three-minute sampling period), the mean is calculated, stored and subsequently transferred to the recording device along with the real time value. The wind direction signals are grouped accordingly into 3° interval classes over a range of 360°, corrected for van orientation to true north, and then averaged.

The normalised and digitised noise signals are compared with a bank of comparators to select the amplitude bands up to and including the incoming amplitude level

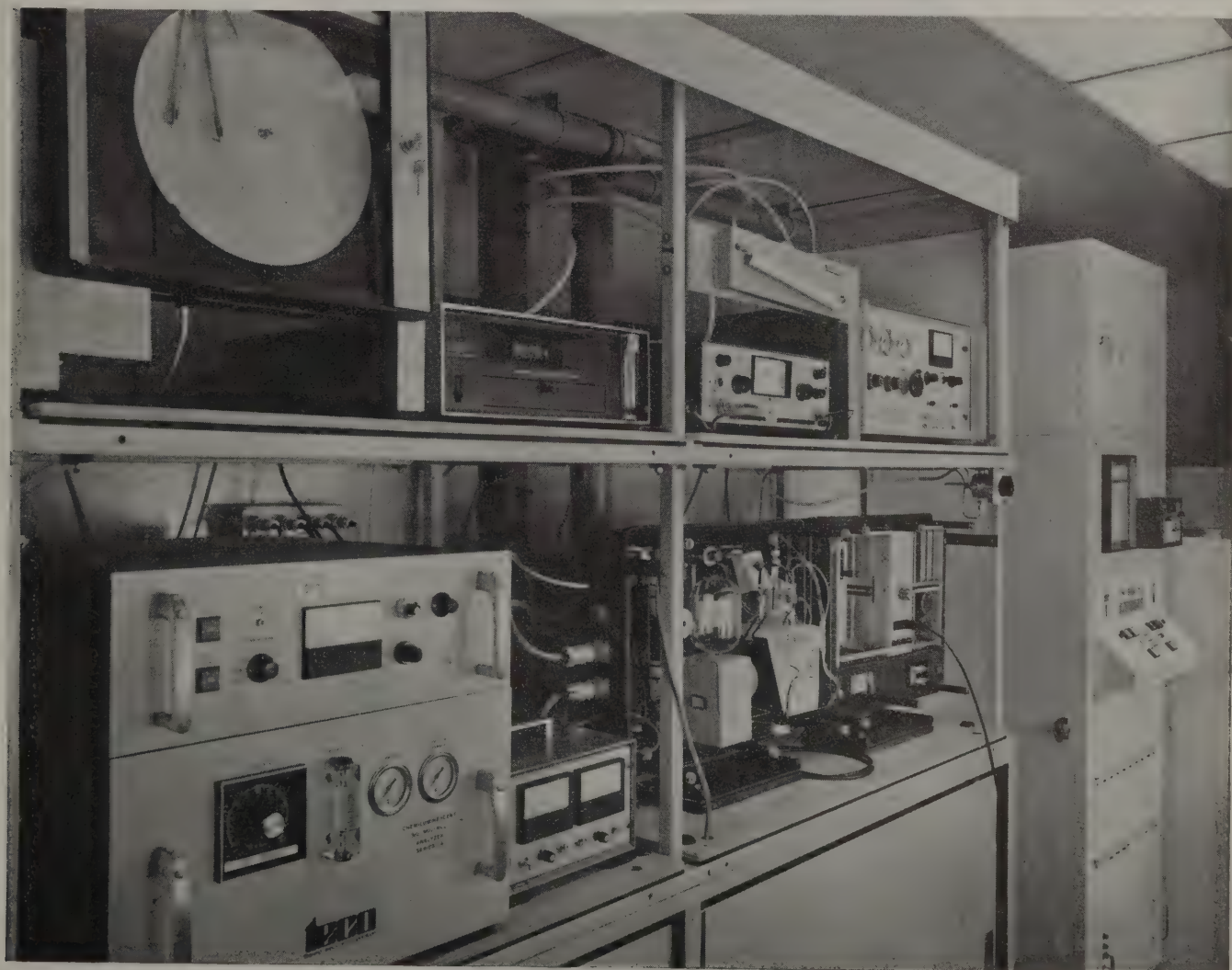


Figure 2

and a 1 is entered in the cumulative counter corresponding to the amplitude bands. On completion of 180 measurements, the cumulative counters are examined and the noise parameters are calculated. The amplitudes corresponding to the counters are then selected and transferred to the recording device.

The data logger also has facilities for manual input of information onto the recording device. For this purpose a numeric console is provided from which coded information (eg van position and orientation, date, calibration and zero data, instrument ranges, etc) is transferred to output buffers and then stored on tape. The system has been designed to enable the operator to view, on request, the instantaneous value of any input signal, as well as the computed three-minute means and noise parameters. A six-channel recorder is also provided as a back-up record of the three-minute mean values.

#### Design of power supply

The design of the electrical system was based on supplying 240V AC and 24V DC to the instruments and ancillary facilities in the mobile laboratory. For extended monitoring at locations remote from mains supplies and to power the instrument electronics, while the van is in transit (thus avoiding long warm-up periods) an integral electrical power supply is required. Because of the likely interference with noise measurements, contamination of ambient air samples by exhaust gases and public noise nuisance, a portable generator was considered to be unsuitable as the primary independent power source. Rechargeable batteries are thus the only viable option and sufficient storage capacity for six hours' continuous monitoring is provided.

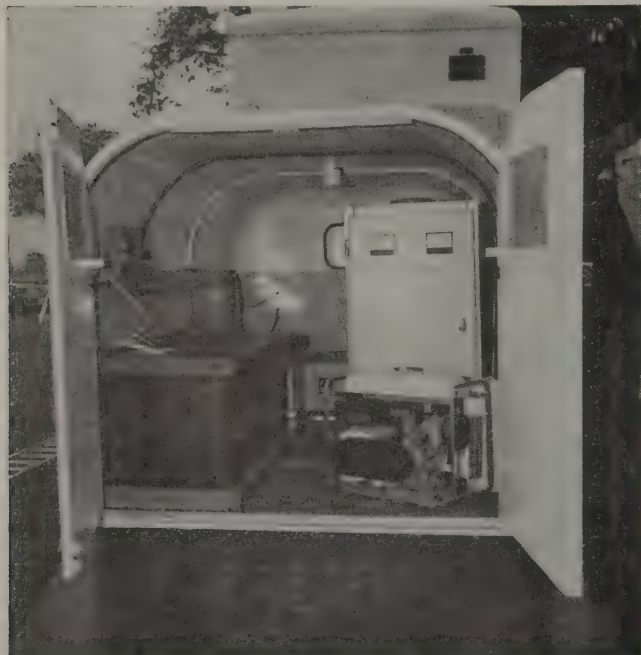


Figure 3

The batteries and associated inverters and chargers are located in a two-ton capacity trailer which has been insulated and weather sealed and is force ventilated. As shown in figure 3, two banks of nickel-cadmium cells are provided, each with an output of 24V DC. One unit powers the monitoring instruments and data logger and the other unit the ancillary equipment.

Simultaneous operation of the monitoring and data logging equipment, battery charging and regeneration of the storage heaters requires a 240V, 30A mains power supply. Provision has also been made to operate the

monitoring and data logging instruments only, from a 240V, 13A mains supply.

Batteries can be fully recharged over a period of 10 hours. Overload and excessively high discharge alarms and automatic cut-outs are included. Ampere hour meters give an approximate indication of the state of charge of the batteries. In the event of a mains failure, power from the batteries is automatically switched on. A portable generator is provided as a further back-up power supply, which can be operated downwind on a 30 m length of cable.

#### Coachwork and fittings

After considering a number of possible vehicle configurations, a 28 m<sup>3</sup> Luton body on a 7.1-tonne capacity laden weight chassis, was selected as the most suitable in terms of internal working space, accessibility and instrument layout (see figure 1). Extensive interior modifications of the Luton body included complete insulation, installation of instrument racks on anti-vibration mountings, desk, workbench, sink unit and 135 litre water tank, storage cupboards, and chemical toilet.

#### Data processing

Data recorded in the mobile laboratory will be processed using a small minicomputer unit, which consists of a tape reader, 4K words central processing unit memory, 64K words of tape cassette storage and a thermal line printer.

Each data tape cassette can store up to one week's continuous monitoring data. All recorded values are in scaled format and must be converted to the corresponding units of concentration, decibels, etc. These converted values are then stored in main computer tape files which are updated week by week and are used for further processing. In order to preserve the accuracy of the records, a parity check is logged onto tape and checked by the minicomputer before accepting the data.

#### Operational capabilities

The fully integrated mobile laboratory with its operational flexibility offers an economic solution to the problem of continuous multi-parameter monitoring, data reduction and data logging of ambient air quality and noise levels with the further advantage of a wide area coverage. The design capabilities of this facility have been tested and proven in the field by continuous operation on site at Teesside.

#### Acknowledgement

*The authors wish to thank the Phillips Petroleum Co. and the partners of Cremer and Warner (London, SW1) for their permission to publish this paper.*

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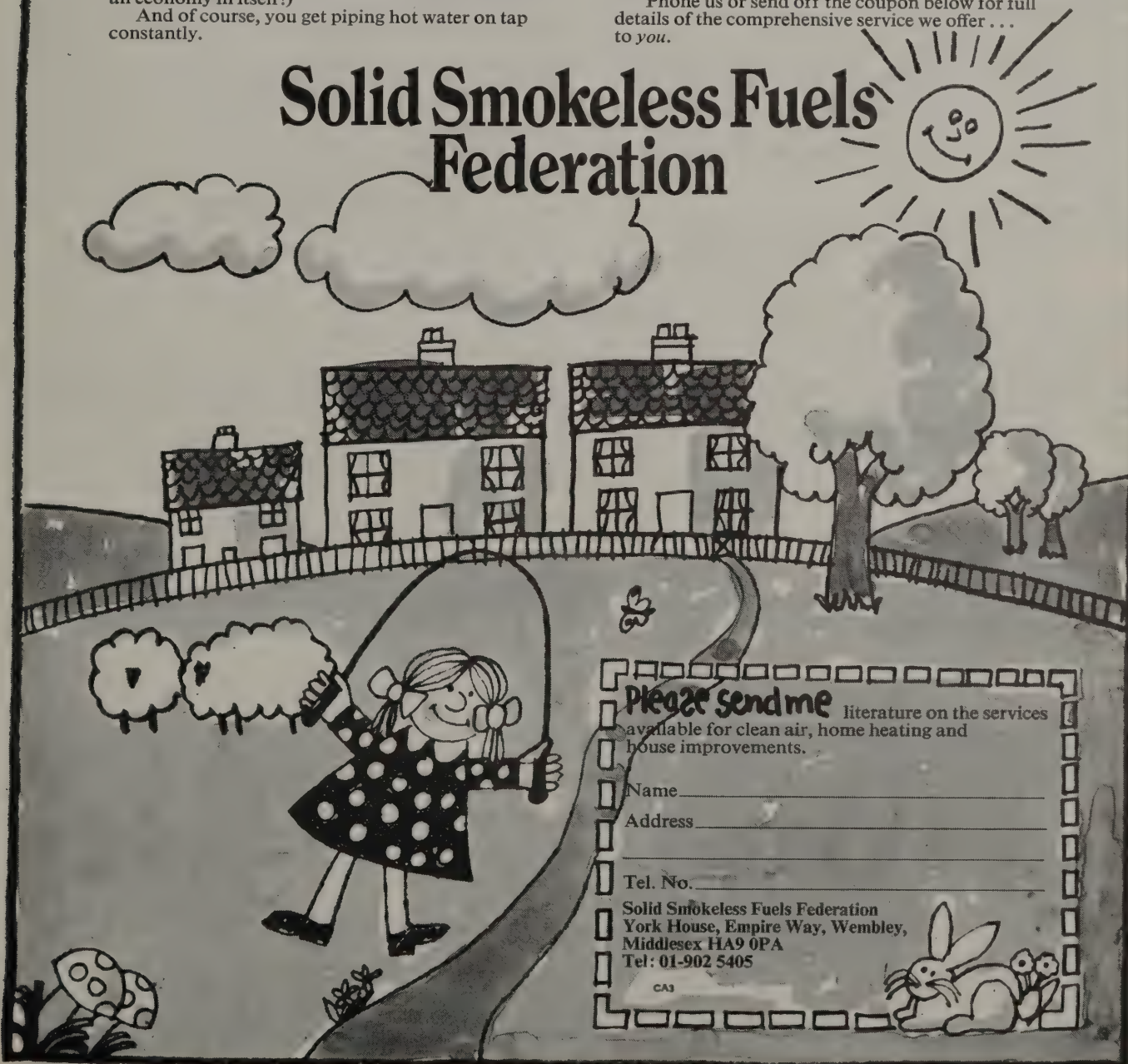
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National Society For Clean Air

# NEWS FROM THE DIVISIONS

## EAST MIDLANDS

*Notes of a meeting of the Division held at the Scientific Services Department of the Central Electricity Generating Board at Ratcliffe-on-Soar Power Station on Thursday, 31st October, 1974*

Approximately seventy representatives took part in an unusual, extremely interesting and carefully organised visit to the Scientific Services Department of the Central Electricity Generating Board at Ratcliffe-on-Soar Power Station.

The visit was by kind invitation of Dr G. K. Williamson, Director of the Scientific Services Department who welcomed the Division. Dr. R. V. Riley (Divisional Chairman) thanked Dr. Williamson for his welcome.

Dr. Roberts introduced in turn the three speakers for the morning who gave short talks illustrated with slides.

Mr. A. Martin dealt with Air Monitoring in the East Midlands: this is carried out by the Central Electricity Generating Board as a part of the organisation. The task of the Scientific Services Department deals with what is emitted and what happens. Surveys commence two years before the construction of a new power station begins and continue throughout the construction period and beyond, giving a picture of events for ten years or more. Mr. Martin discussed the use of the Standard Grit Deposit Gauge and the Daily Volumetric Filter and showed slides of deposits, together with views of the behaviour of cooling tower plumes.

Mr. N. J. Ray next took up the problems of the Environmental aspects of Ash Disposal and Water Utilisation, describing the way in which coal was used in Pulverised form and gave rise to Pulverised Fuel Ash (PFA), some 80 per cent of which fell to be dealt with by the electrostatic precipitators before the combustion products passed up the outlet stack. Ash produced by a 2000 MW station could amount to 2000 tons per day. Ash particles very much enlarged were shown on slides. Mr. Ray outlined methods of dealing with PFA and gave examples of how this could be used for land reclamation.

The final session in the morning was taken by Mr. T. Langford whose subject was Biological Aspects of Power Station Discharges. Mr. Langford demonstrated that pollution control went further than limiting levels of emission; it was concerned with the effect on ecosystems generally. Much of the investigation naturally concerned the effect of rises in temperature upon the biology of rivers. Whilst the temperature rises were rarely sufficient to prove lethal to fish there were the possible effects upon the smaller organisms that the fish feed on and also the subtler chemical effect. Various experiments were

described which had provided information on movements of fish and on growth in waters accepting cooling discharge from power stations.

At the close of the morning session those present were taken by coaches to Yew Lodge in Kegworth where an excellent lunch was provided.

Back at the Scientific Services Department at 2.30 p.m. the members arranged themselves into six groups indicated by number on identity labels prepared by the Department. Six guides—Messrs. M. Ball, D. Clare, W. Wrigley, A. Roberts, M. Skinner and C. Birkby, then conducted the groups around the building where they were in turn given short talks and illustrations on:

Instrumental Control of Combustion—a simulated control board to show how input was balanced against output on a power station under varying loads and conditions (Mr. R. Wilson).

Oil burners and requirements for efficient combustion together with a demonstration of effects of pressure on the shape of the flame (Mr. D. Brinkworth).

Use of PFA in agriculture—the various requirements—the results of work carried out and pictures of some of the resultant crops (Mr. D. Simpson).

Combating and reducing noise from various pieces of equipment and machinery used on the power station itself and for ancillary purposes (Mr. G. Antippa).

Sampling coal for assessment of quality and negotiations on price—the problems involved and the procedures adopted (Mr. J. A. Brown).

Radiosondes—Scientists are sending up radio transmitters by balloon to measure high-altitude air conditions and investigate their effect on plumes of water vapour from power station cooling towers. Each hydrogen-filled balloon rises to a height of up to 3,000 feet with the radio sending a continuous stream of information back to ground about the humidity, temperature and atmospheric pressure. A small time fuse then releases the transmitter and instruments which fall to earth by parachute, ready for collection and the next flight. The balloon continues to rise until it bursts in the reduced air pressure of the upper atmosphere.

The C.E.G.B. team are co-operating with a team from Nottingham University's physiology and environmental studies department. The object of the joint research is to carry out simultaneous investigations of atmospheric conditions at West Burton and in the vicinity of the sister 2,000 megawatt power station at Ratcliffe-on-Soar to study the factors affecting the dispersion of plumes from cooling towers at all the 2,000 megawatt stations in the area.

The equipment used can measure and record conditions to within one-tenth of a degree centigrade, 2% of relative humidity and five millibars of atmospheric pressure.

The party then reassembled at the Station Sports and Social Club for tea, when there was an opportunity for further discussion with the various guides.

There is little doubt that for the majority of the members the day had been a source of some surprise at the range of activities carried out by the Scientific Services Department and the various comments bore testimony to the interest which the visit had aroused. Equally impressive was the way in which the whole day ran perfectly to a very full timetable which had clearly been very carefully prepared.

Before leaving, Dr. R. V. Riley, the Chairman of the Division, expressed thanks to Dr. Williamson and all his staff for a most interesting and enjoyable visit and for generous hospitality which they had extended to the Division.

## NORTHERN

### Joint Clean Air Committee for the North East

During 1972, under the chairmanship of Alderman Mrs. Patience Sheard, a special Investigation Panel of the Clean Air Council was charged with the task of examining the progress of smoke control in the North East region, about which considerable concern had been felt for some time. For a variety of reasons, not unassociated with the economic problems of the area, the region had not given a particularly high priority to smoke control and the publication of the Panel's report in November 1972 had a marked effect on the attitude of local authorities in the field of domestic smoke control.

Since the publication of that report there has been an upsurge in smoke control activity in the region, and

in order to maintain the momentum of this activity there has been established a Joint Clean Air Committee for the North East operating under the aegis of the Department of the Environment. The establishment of this Committee is in accord with recommendations in the report of the Investigation Panel of the Clean Air Council as that Panel expressed the view that a Clean Air Committee for the Northern Region should be inaugurated with a duty to watch progress in smoke control and to take all practicable steps to promote it.

This Joint Committee, under the chairmanship of Councillor Mrs. J. M. Scott-Batey, member of the Northern Economic Planning Council and Chairman of the Health and Environment Committee of the city of Newcastle upon Tyne, had its inaugural meeting at the Regional Offices of the Department of the Environment in Newcastle upon Tyne on the 13th September 1974. The Committee comprises a total of 17 members, including local authority representatives, fuel industries' representatives, officers in the Department of the Environment and four individual members, amongst whom is the Honorary Secretary of the Northern Division of the Society, Mr. L. Mair of Newcastle upon Tyne.

Whilst the business of the first meeting was mainly exploratory, much useful progress was achieved by reviewing the present situation of domestic smoke control in the North East in relation to the individual progress achieved by the constituent local authorities.

There is little doubt that this Committee means business and that laggard authorities in the North East region will not be allowed to vegetate undisturbed in the field of air pollution for very long. It is envisaged that regular progress reports, both in air pollution reduction and in smoke control progress, will act as a suitable incentive to lift the Northern region from its lowly position in the clean air league and the Committee views with confidence their intention to achieve complete smokelessness in the region before 1980.

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## OBITUARY

William Arthur Horne, a former President of the Scottish Division of the Society, died on 31st October, 1974. He was 72.

William Horne was a native of Inverness and graduated in medicine at Glasgow University in 1923. He became an M.D. (with Honours) in 1958, having gained a Diploma in Public Health in 1924.

After a spell as Medical Officer in Knightswood Fever Hospital, Glasgow, he was appointed Tuberculosis Officer in the Glasgow Public Health Department, under the then Medical Officer of Health, Sir Alexander MacGregor. He passed through all grades in the department, being for some years Medical Officer for the Northern Division of the City, then Senior Assistant Medical Officer of Health in charge of tuberculosis services, and in due time Deputy Medical Officer of Health. He was appointed Medical Officer of Health in 1955.

William Horne lived through a period when infectious disease was an everyday occurrence. Enteric fever was often present and, in his position as Port Medical Officer, small-pox was not unknown to him.

He was interested in all aspects of preventive medicine but will be remembered mostly on the side of personal medicine by his work in the eradication of tuberculosis and in respect of community medicine by the huge programme directed by him for the prevention of atmospheric pollution.

In the drive against tuberculosis a great contribution was made by the X-ray Campaign in 1957, when some 750,000 people were X-rayed in Glasgow. The result of his planning in the environmental sphere has been the elimination of smoke pollution from over three quarters of the city. His labours brought vast benefit to the mental and physical wellbeing of the citizens, and for his services to medicine in this way, he was awarded the C.B.E.

Dr. Horne was a founder member of the Scottish Division of the National Society for Clean Air for which he did a great amount of work. During his period as President of the Division his endeavours enhanced the standing of the Society in Scotland. At the time of his death he was a member of the Clean Air Council for Scotland.

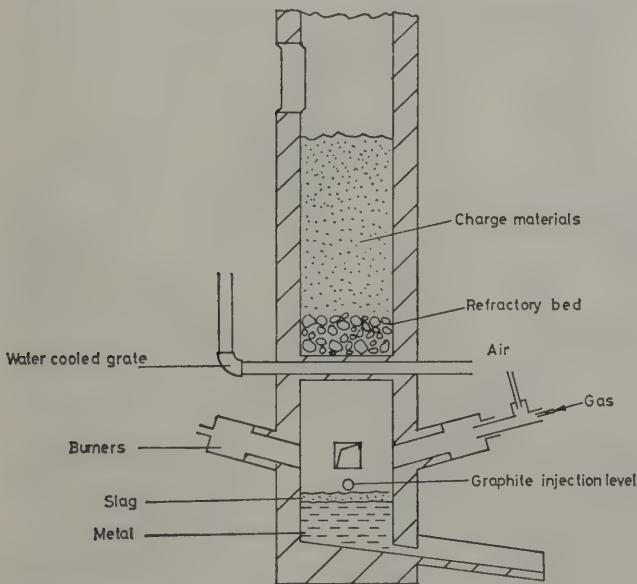
Dr. Horne was a man of outstanding personality; once he had determined the right course he followed it fearlessly preferring the hard "right" to the easy "wrong". These qualities made a valued counsellor both in public and private life and led to his advice, always so readily given, being so often sought. He is survived by his wife to whom we offer our deepest sympathy.

# The Hayes Shell-Cast Cupola

by  
D. A. Spurrier

The Ironfoundries Association have arranged a series of visits to foundries throughout the country, and have invited people from a wide range of organisations concerned with the control of the foundry industry to take part. One of the visits arranged in the Midlands was to the foundry of Hayes Shell-Cast Limited, Lye, Stourbridge, where a cokeless cold blast cupola has been operating for several years.

In 1967 the Company looked at the possibility of extending the melting time of their cupolas so that they could be run for up to 18 hours on two shifts, but because of problems with refractory linings, and the design of the cupola preventing water cooling, this was not possible.



Patent No. 1 326 884.

Diagram 1

The Company decided to design and develop a fully gas-fired cupola by converting an existing 5 tonne per hour cupola, and this started operating in December 1970. So far over 12,000 tonnes of metal has been melted.

The principle of the cokeless cupola (Diagram 1) is similar to a conventional coke cupola in that it is a shaft type furnace. The shaft is partitioned by a water-cooled grate made up of several refractory coated tubes supporting a refractory bed and the charge materials. Below the grate are six high intensity gas burners attached to the cupola in limpet fashion; these ensure that com-

bustion is completed within the burner quarl so that underneath the grate and above where the metal and slag finally collects is a distribution zone and not a combustion area. The burners operate with excess fuel so that there are partially reducing conditions inside the cupola. Carbon lost during melting is replaced by injecting graphite into the well of the cupola. Tapping of the iron is carried out in the normal way.

The original cupola was fired with propane, but trials have been carried out with natural gas and light fuel oil and the cupola is, at the present time, fired by three propane burners and three oil burners.

The Company claim a number of advantages for the cupola including cleaner iron, a reduced amount of slag, less limestone additive, much more fluid iron at a given carbon equivalent value. It is also possible to pour thin section castings at a lower temperature without fear of mis-running. There is also a marked reduction in wear on the refractory enabling two shifts to operate before patching is necessary.

Air pollution is also reduced. At the time of the visit there was no visible emission from the top of the cupola and the Company claim that grit emissions have been reduced from approximately 45 kg/hour to 4.5 kg/hour together with a reduction in sulphur emissions because of the use of sulphur-free fuel.

The emission tests were carried out by the British Cast Iron Research Association in 1971 and since that date further modifications have been carried out which should have improved emission levels. The Company have now purchased measuring equipment and intend to carry out a series of tests which will be published when available.

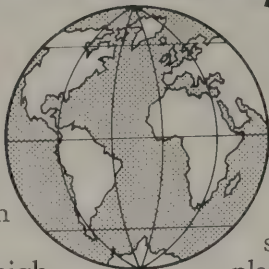
The operating cost of the unit will vary greatly, depending upon the method of operation, fuel costs, the type of iron produced etc., but they are likely to be either comparable with a coke cupola or slightly higher. But against this must be weighed the capital cost and maintenance cost of pollution control equipment which is normally required, and less easily quantifiable advantages such as the need for less storage space for coke.

World-wide interest has been shown in the process and a subsidiary company, Hayes Shell-Cast (Developments) Limited, has been formed to market the cokeless cupola. Licence agreements have been made with foundries in the U.K. and a recently completed oil-fired 10 tonne/hour cupola is operating at the British Steel Corporation works at Distington. Any queries concerning the cupola should be addressed to Hayes Shell-Cast Limited, The Hayes, Lye, Stourbridge, West Midlands.

Reader Enquiry Service No. 7495

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# BOOK REVIEWS

## Dust Control and Air Cleaning

by R. G. Dorman. Published Pergamon Press. £18.00. 1974.

This book, edited and part-authored by R. G. Dorman, Superintendent of the Physics Division of the Chemical Defence Establishment, Porton Down, is the Ninth volume of the International Series of Monographs in Heating, Ventilation and Refrigeration, prepared under the general editorship of N. S. Billington and E. Ower.

The volume is published by Pergamon Press, and is very well printed and illustrated. In addition to Mr. Dorman's own chapters, which amount to some two-thirds of the 600 or so pages in the book, specialist contributions from experts in the fields of occupational health, utilities, atomic energy and mining are included.

The first chapter of the book deals with the effects of dust and other particulates on health, emphasising the important part played by the size of the particles, and is followed by a long Section dealing with the dynamics of particles in motion.

A chapter on sampling completes the more academic approach to the subject; then follow eight chapters dealing with the practical aspects of extractor hood design, dust collection equipment, filter materials and testing. The latter Section, one of Mr. Dorman's specialties, is very good, particularly in its descriptions of the various mono-disperse aerosols for filter testing.

Specialist Sections on the problems of air cleaning in the atomic energy industry, on clean rooms, and on dust problems in the mining industry complete the practical Sections, and are followed by a short discussion on economics.

The author calls attention to the fact that much of the intensive research documented in this book comes from physicists, and this leads to what is, in my view, a very valuable feature of the book, ie the detail with which the underlying principles are discussed throughout the whole coverage.

The "cover blurb" claims that the book will be valuable to students and graduate engineers, as well as to industrial engineers working in the field. I would not quarrel with this view, but the general editors' claim that a student "having mastered the basic principles embodied in the book will become a competent engineer capable of handling a majority of the tasks he will meet", needs some qualifying.

The chapters on Mr. Dorman's specialist field (very high-efficiency separation of superfine particles in relatively low concentrations) are very good indeed, as are those on occupational health, electrostatic precipitation,

clean rooms, and air cleaning in the atomic energy industry—indeed the chapters dealing with the latter two subjects should be required reading for all industrialists concerned with the installation and operation of gas cleaning equipment, such is the wealth of detail of the precautions and care needed to operate this equipment to consistently high standards.

It is particularly interesting to note that while in general pollution control we have to be satisfied with percentage removal efficiencies in the upper 90's, workers in the "super-filtration" field have had to devise new terminologies to define the performance achieved. These include "percentage penetration" (which may be as low as 0.001, corresponding to a removal efficiency of 99.999 per cent), while for the clean rooms classification is in terms of the number of particles above  $0.5 \mu\text{m}$  left in the cleaned air; the highest classification is for 100 particles per cubic foot, and this would correspond to a removal efficiency as high as 99.999999 per cent in extreme cases!

It would have been of great interest to "ordinary" engineers to know precisely how much more it costs to attain such high efficiencies compared with those achieved in practicable pollution control, and though some general cost of figures are given, there are insufficient data to extract a meaningful conclusion. Perhaps the editors will attempt to do this in a subsequent edition of the book.

While the Sections concerned with the nature of the problems encountered in high efficiency air cleaning are good, it is a pity that the author has attempted to deal with general pollution control also, for the chapters which deal with what the chemical engineer calls "gas cleaning" are not nearly so good as the specialist Sections. For example, the chapters on settlement, impaction, centrifugal separation, and scrubbers are too diffuse to be of real value, and perusal of the chapter on air pollution will certainly not make the student into a "competent engineer". It is also a matter of some surprise to see that pollution in the chemical industry is dismissed in seven lines!

However, it may be that the criticism is only engendered by the excellence of the specialist Sections, and I can thoroughly recommend the book to all who are interested in the separation of the finer particles, whether to avoid a nuisance or a danger, or to produce clean air for process or other use. It is clear, however, that the author will have to make up his mind, in preparing a second edition of the book, whether to leave out the chapters on general pollution and its control, or to improve them to the standard of the main content.

In the present edition the chapters are well set out, adequately illustrated and referenced. There are some

misprints, only some of which are dealt with in the erratum slip in the preface, but none is serious or misleading.

The References are collected at the end of each chapter; in other reviews I have preferred them to be collated, chapter-wise, in a special, easily found Section at the end of the book. But in the present case the individual contributions are so self-contained and easily readable as to make the chosen method wholly acceptable.

At £18.00 the book is not cheap, but when one considers the wealth of information which is provided, the money can be considered well spent.

*C. J. Stairmand*

Reader Enquiry Service No. 7497

### **Solid Smokeless Fuels Federation Annual Report 1973-74**

A very good start was made to the year, with exhibition equipment booked for months ahead, a noticeable increase in the sale of all types of solid fuel appliances, and supplies of all types of solid smokeless fuels flowing freely.

Progress was unfortunately held up due to the miners' strike, which began in November, and although producers and distributors made a good job of maintaining supplies, six local authorities found it necessary to suspend their smoke control orders for a short time.

These difficulties also had an effect upon the sale of solid fuel appliances, but recovery from the effects of the strike was quite remarkable and with the enthusiasm shown in the industry, there seems no reason why the expanding market for appliance sales, so noticeable in 1972/73, cannot be redeveloped.

Reader Enquiry Service No. 7498

### **Environmental Health Report 1973**

*The Association of Public Health Inspectors. 50p.*

In spite of difficulties in collecting data during the year of local government re-organization, the tenth report of the Association of Public Health Inspectors still covers 52 per cent of the population of England and Wales and 550 local authorities. It gives therefore a representative picture of the state of environmental health in this country and of the work carried out by public health inspectors in 1973.

Satisfaction is expressed by the Association that the comprehensive environmental health departments of the new district councils are now in charge of chief environmental health officers who mostly have a chief officer status and are members of management teams. With the departure of the Medical Officer of Health from local government to the National Health Service, says the report, the credit due to him should be acknowledged, for the part he has played in the past in protecting and improving the health of the public.

The new responsibilities of public health inspectors (or environmental health officers as they are now coming to be called) will be extended still further by the new legislation concerning pollution, noise, safety and health at work and housing.

The emphasis in pollution control is now turning to the less obvious but more insidious forms of pollution such as that caused by heavy metals and by lead compounds emitted both from motor vehicles and from certain industrial processes. "It is becoming increasingly obvious" states the report, "that we need to know far more both about the extent of the problem and the short and long term effects on the human body". With larger and better equipped local authorities after re-organization, the "complaint-nuisance" approach to pollution control must be replaced by the formation of specialist units to make a positive planned attack on the air pollution problems in any particular area. A close liaison with industry is most important, says the report.

Research into noise control generally, will be one of the most important tasks of the new environmental health departments. The environmental health officer who is in close touch with the public, will be able to obtain much useful information, particularly about noise affecting residential areas. The report welcomes the many urgently needed reforms contained in the Control of Pollution Act, such as measures to control noise from construction sites, noise in the streets, a revision of the nuisance law and the introduction of noise abatement zones, a concept developed originally by the APHI.

The report emphasises once again the need for continuing research in the subject of waste disposal. The recovery of materials from waste, the recycling of waste and the use of waste heat from incinerators are matters being currently examined, but a new look must be taken at the whole system, and waste disposal, in all its complexities, requires an inter-disciplinary approach.

Reader Enquiry Service No. 7499

### **Aspects of Pollution associated with the Process Industries** *D. H. Napier. A Keith Shipton Developments Special Study.*

This pamphlet surveys the environmental disposal and control problems of chemicals in the process industries. These industries possess the potential for producing widespread pollution which may result either from working to inadequate standards or from a lack of realization of the particular hazard.

It must be understood that pollution can represent considerable wastage of industrial materials over a period of time, as well as the familiar ecological, medical and legal problems.

The pamphlet points out the situations in which the process industries can cause pollution and examines methods of disposal of waste chemicals. It goes on to summarize effects of specific chemicals on working and general environments.

"Dr Napier is responsible for the MSc course in Industrial Safety at Imperial College and also serves on a number of committees concerned with various environmental topics."

The pamphlet deals in turn with Chemical Interactions with the Environment, the disposal of waste chemicals, control authorities, considerations of specific chemicals in certain individual details. It is undoubtedly a reference which deals more with specific details than with broad generalizations and is worthwhile for this factor.

Reader Enquiry Service No. 7500

**Health Aspects of Environmental Pollution Control: Planning and Implementation of National Programmes.**  
*Technical Report Series WHO No. 554.*

An expert WHO Committee report states that in the formulation of environmental pollution control programmes, four basic questions must be answered. Initially what and how much should be done? Secondly how should it be done? Thirdly, who should do it, and lastly, when should it be done? Answering such questions involves understanding the relationships between pollution and health, which is a major problem. It includes consideration of the attitudes of the people and institutions involved: including the political, economic and social circumstances, as well as the level of development reached.

According to the Report there are two principal approaches to environmental pollution control—environmental quality management, (relating control requirements to the desired quality of environmental media) and the ‘best practicable means’ approach.

This Report covers in extensive detail, such topics as (a) policy formulation, (objectives, priorities, cost/benefit analysis), (b) technical programme components (criteria, risk and benefit considerations, standards and guides); (c) organizational programme components (legislation, implementation plans, administrative arrangements, co-ordination, evaluation resources) etc.

Reader Enquiry Service No. 7501

**H.M. Chief Inspector of Factories Annual Report 1973**  
*H.M.S.O. £1.10.*

The Report ranges widely over the various aspects of the Inspectorate's work under the heading of industrial hazards; the Accident Prevention Studies Unit; safety and health activities; occupational hygiene; occupational hygiene laboratories; accident experience. It contains 15 appendices comprising statistics and details of the Inspectorate's publications and research activities, and is illustrated with photographs.

A good deal of space in the Report is devoted to the accident record of the construction industry. In his introduction to the Report, Mr. Brian Harvey, H.M. Chief Inspector of Factories, announces that due to the “extraordinary and discouraging history of accidents that should not happen”, a special watchdog unit may be set up to monitor the construction industry's safety performance.

In the section dealing with environmental health, Mr. Harvey states that the Inspectorate's efforts in the field of occupational hygiene continued to increase. Particular attention is drawn to the wide range of risks involved and the increasing extent to which the Inspectorate is concerned with cancer-producing materials. Mr. Harvey claims that the Inspectorate's new Occupational Hygiene Laboratories at Cricklewood are “amongst the best of their kind anywhere”. Indicative of what progress has been made is that in 1966 when the Industrial Hygiene Unit was first set up the laboratory processed 1,373 samples; in 1973 the figure was 12,850.

Mr Harvey adds: “The whole of the Inspectorate is now geared to the enforcement of the health requirements of the legislation in terms of the scientific measurement of risk and the scientific monitoring of precautions which are taken to minimise it. Industry, I am sure, welcomes these developments. Many companies

already use sophisticated scientific methods to monitor these precautions. I hope that other companies will quickly follow suit. In the future it will be essential in some processes for management to be able to demonstrate beyond challenge to their workpeople that proper control is exercised and this can only be done if the monitoring methods are above reproach and the results freely discussed.”

High priority is given to encouraging observance of the Noise Code of Practice published in 1972. Over 500 factories were selected in 1973 for special “noise visits” and follow-up visits were made to 500 others already visited in 1972. Specialist Inspectors in the Noise and Vibration unit advise industry on the more difficult noise problems, and visit machinery manufacturers to draw attention to the need for machinery design to be improved from the noise point of view. The Chief Inspector reports that industry has shown a great deal of interest in noise and the action necessary to protect workers from it.

As part of the continuing pattern of enforcement, Inspectors pay special visits to all factories and construction sites where asbestos is known to be used. Work continues on a major long-term medical environmental survey of asbestos workers.

During 1973 there were 128 deaths associated with previous exposure to asbestos. Since this is a long-term disease, this figure reflects conditions in the past when, in the then stage of knowledge, it could not be ascertained with any certainty what levels of air contamination by asbestos dust would endanger health. Results of Phase II of a major long-term medical environmental survey of asbestos workers, embracing the larger manufacturers of asbestos products, showed that over 90 per cent of the dust counts were below the very stringent hygiene standard of 2 fibres per millilitre. This reflects the very great efforts made by the major firms in the industry to improve standards of control.

Both the general Inspectorate and the Industrial Hygiene Unit are making a sustained effort to ensure that all factories handling lead progress towards proper control. In general, the industry's response to the Lead Code of Practice for Health Precautions has been “encouraging”.

Reader Enquiry Service No. 7502

**The Electricity Council Annual Report 1973/4**

Sir Peter Menzies, the Chairman of the Electricity Council starts off his report by saying “The fuel emergency last winter—the miners' strike and Middle East oil crisis—highlighted the country's almost total reliance on electricity.” But just as in the report of the National Coal Board and that of the Gas Corporation, much space is devoted to an explanation of the loss of £176m suffered by the industry. Although inflation exacerbated by the fuel emergency played its part, the report clearly states the cause as being the government's policy of price restraint.

Although the mild winter certainly helped the electricity industry to weather the storm caused by the miners' strike and the three day week, there is no doubt that this was helped by the flexible approach to the provision of generating capacity, and the Electricity Council now consider that the generating system needs even greater flexibility to react to alterations in the availability and price of different fuels. The Electricity Council therefore have

supported the C.E.G.B.'s proposal to order further nuclear capacity for the 1980s. The 1973/4, 89.8 per cent of the electricity produced came from coal and oil fired stations. The nuclear contribution was 9.6 per cent and gas turbines produced 0.6 per cent. The contribution from diesel and hydro power was less than 0.1 per cent in each case.

In all, 189,555m units were sold, which was the 0.9 per cent decrease on the amount of electricity sold in 1972/73. During the last fifty years, only in one other year, 1945, was there a drop in sales over the previous year. This again is largely attributable to the fuel emergency early in 1974.

Reader Enquiry Service No. 7503

### **The Central Electricity Generating Board Annual Report and Accounts 1973/4**

This report should be read in conjunction with the report of the Electricity Council. It is extremely well produced and contains a vast amount of information. But in reading the report one should bear in mind what the Chairman of the C.E.G.B. says in his opening remarks "The electricity supply industry in England and Wales differs from the coal, oil and gas industry in being, at present, only a modest producer of primary energy—from water power and nuclear power. It is still predominantly a converter and distributor of energy." Inevitably then, the product—electricity—reflects the costs and reliability of the primary fuels needed.

An extremely interesting feature of the report is that a whole section is devoted to the fuel crisis. Although this is obviously written from the point of view of the electricity industry as one would expect, it does present a very fair picture of what happened.

We have already seen how the coal, gas and electricity industry suffered financial losses. Similarly, the C.E.G.B. experienced a loss in the year under review.

Over the year, the C.E.G.B.'s power stations required a heat input of 98.8m tonnes of coal equivalent at a cost, including that of transport, of £699.1m and had the stations been able to work at their full capacity, which they were not because of the fuel crisis, the total would have been about 105m tonnes of coal equivalent. The breakdown into the various fuels is interesting. 63.7m tonnes of coal were used, 24.6m tonnes (ce) of oil were used and 8m tonnes (ce) of nuclear fuel, the balance being made up by 2.5m tonnes (ce) of natural gas. So coal is still the main fuel. Although the C.E.G.B.'s capability to burn oil increased during the year, the total oil consumed at 14.1m tonnes was marginally below the consumption for the previous year.

As for the future, the report makes it clear that the policy of flexibility already referred to in the report of the Electricity Council must be one of the main factors to be considered. The report states "The Board has been concerned for some time about the availability and cost of fossil fuel to meet the expected demand for electricity in the 1980s. Present estimates indicate a possibly critical situation. Therefore the Board regards it as essential that the maximum prudent nuclear plant programme be launched as early as possible to provide additional firm nuclear capacities. For the next ten years after 1980, the Board sees the need for some 36,000 MW of nuclear plant." The report also states "that the Board already has sufficient coal burning capacity to burn far more coal than it has ever consumed before, and more than

the National Coal Board is likely to be able to produce". This is important, for even if the C.E.G.B. are allowed to build the nuclear power stations for which they have asked, it seems likely that the fossil fuel requirement would rise to some 130m tonnes of coal equivalent by the mid 1980s, and every year that the further nuclear programme is delayed adds about 10m tonnes of coal equivalent.

With regard to the choice of the reactor system to be used the C.E.G.B. make it quite clear that whatever needs may be decided for the more distant future, the immediate requirement is for the installation of a series of light water reactors manufactured in this country.

The environment is not neglected—"Care of the environment is a continuous process in which the methods adopted must constantly be improved to meet changing requirements. The key to success is intelligent anticipation of future problems to allow time for the development of corrective measures before a problem becomes acute". In this connection, remedial action to deal with the problem of acid smuts is being taken in the oil fired stations of the C.E.G.B. by implementation of the recommendations of a special working party set up to deal with the problem.

But perhaps more interesting is a small section of the report which is devoted to the use of heat from power stations. The C.E.G.B. has for some time been under fire about waste heat. Perhaps the statement that tepid condenser cooling water "has however, some potential in such applications as fish farming. The Board will be pleased to hear from any other potential users" indicates that there is a slight change of heart. Many people have long advocated the use of waste heat for district heating and similar schemes. And indeed as the report states "it is gratifying that Bankside Power Station is now associated with the district heating scheme which the London Electricity Board is installing on the Thames South Bank." Perhaps the installation of gas turbine power stations in urban areas will offer opportunities for small and medium size district heating schemes.

Reader Enquiry Service No. 7504

### **National Coal Board, Report and Accounts 1973/4**

As is only to be expected, the report and accounts for the coal industry for 1973/4 do not make very cheerful reading. As Sir Derek Ezra states at the opening of his statement: "For the coal industry, 1973/4 was a year of serious adversity in industrial relations, yet one of intensive planning of the industry's future based on the National Coal Board's conviction that indigenous coal must make a major contribution to the nation's future energy requirements." The statement then outlines the main features of the dispute which caused the overtime ban in late 1973, the strike in the early part of 1974. Nevertheless, perhaps because of the trebling of the landed cost of crude oil which gives coal a significant advantage, the N.C.B. have been engaged throughout 1973/4 on the detailed preparation of a long term production plan based on substantial capital investment for new capacity. In this way they hope to be able to take advantage of the new opportunities created by the developments in the energy market.

Looking at the results, during the thirteen weeks of the overtime ban to February 9th, 1974, the loss in output averaged 0.8m tons a week and totalled 10 million tons over the period. This caused a drop in overall stocks to 24 million tons, and at the end of the four week strike

that followed the overtime ban, overall stocks had dropped to approximately 19 million tons. The total output was some 34 million tons less than that in the previous year and this in turn led to an overall deficit of £130.7 million. Man power in the same period decreased by 21,100, the run down being twice that in the previous year. In spite of all this, inland coal consumption in 1973/4 reached 95 per cent of the previous year's level.

So far as the environment is concerned, the N.C.B.'s Environmental Policy Group has continued to co-ordinate discussions with the government departments on the implication of the legislation recently enacted. Sample surveys, for example, have been carried out of noise levels at collieries by effective monitoring. Environmental considerations have been stressed at all levels of training. The report states that "Coal's increasing importance in the new energy situation has not affected the Board's attitude towards pollution: protection for the environment is regarded as an extremely important facet of new mining developments".

Those sections of the report dealing with research and development and prospects for the future make rather more cheerful reading. Recent developments in the energy market present considerable new opportunities for British coal. Power stations, it is said, will continue to be the main market for coal in the foreseeable future. Before the massive increases in the price of oil, the Central Electricity Generating Board estimated that their demand for coal would rise within a range of 65-75 million tons at existing stations over the next ten years. The N.C.B. now consider that the potential demand by power stations could be as high as 100 million tons by the mid 1980s. In addition to this, the N.C.B. think that the 1990s may well see the increasing importance of coal conversion as the prices of conventional oil and natural gas continue to rise. Nevertheless, "the outlook is inevitably uncertain, bearing in mind the long lead times involved, so that there is a strong case for widening the range of options available in the longer term by embarking now on a programme for increased research into the new technologies to utilise coal. This should be done on a national, rather than narrow industry basis; co-ordination between the energy industries will be required to ensure that the energy available is used at the highest efficiency and with the minimum of capital investment. There will be a need also for international co-operation, particularly with the United States."

Reader Enquiry Service No. 7505

### **British Gas Corporation Annual Report and Accounts 1973/4**

This report covers the first full year of the Corporation's operations. Although sales of gas were up by 13 per cent on those of the previous year, the year under review proved a difficult one. Nevertheless, British Gas were able to meet all normal demands made by existing customers. The conversion to natural gas continued on schedule and by the 31st March, 1974, 77 per cent of all customers had a direct supply. It is expected that 90 per cent of customers will be connected by the end of the current financial year.

So far as supplies of gas are concerned, the Corporation was able to purchase gas from both the British and Norwegian parts of the very large Frigg field in the North Sea, thereby securing a significant increase in gas availability and an important addition to the energy resources available to the country.

Turning to financial results, the Board made a loss of over £41 million in the year ending 31st March, 1974, largely as a result of price constraints imposed by the government. Sir Arthur Hetherington, the Chairman of the Corporation, however makes the point that had the Corporation been allowed to increase the average price per therm of gas in step with the movement of the Retail Price Index over the previous two years, the profit last year to the Gas Corporation would have been £100 million. He says "although the government is making some compensation to the Corporation, we believe that it would be very much better for British Gas, and for the country, if we were allowed normal commercial freedom to increase our prices to the necessary level for our profitable operation."

In 1972 the gas industry was supplying some 23 per cent of the country's useful heat. The industry's contribution has increased significantly since then and is probably nearer 30 per cent this year; by the early 1980s natural gas could be supplying as much as 40 per cent of Britain's heating needs. The Corporation are optimistic about the chances of finding and procuring further supplies of gas from the North Sea and other parts of the Continental Shelf. The procurement of gas from the Frigg field is now in the planning phase. It is not yet known when the gas will become available in quantity but it is known that when it does come, it will be in very large quantities indeed and the Corporation look forward to increasing their share in the supply of the country's energy requirements.

Reader Enquiry Service No. 7506

### **Trace Elements in the Atmosphere**

by Hans Israel and Gerhard W. Israel published by Ann Arbor Science, 1974. 158 pages.

The thin red line of meteorologists and kindred scientists which held against the early threat of environmental catastrophe have now been reinforced by battalions of engineers with heavy equipment. If the delicate fabric of environmental truth is to survive the impending advance we must furnish them with charts and guides. The recent edition of TRACE ELEMENTS IN THE ATMOSPHERE by the late Professor Hans Israel, translated by his son, does not quite qualify for the job.

A short monograph giving a personal view of this wide field would be most welcome if it were a fresh account of the foundations of the subject. Unfortunately this book achieves crispness and authority only in the forty pages devoted to Professor Israel's areas of specialization—charged aerosols, ions and radioactivity. The sections on trace gases, aerosols and air pollution seem very old, too brief and indiscriminate in the snippets of fact and opinion selected for presentation. Much of this material is taken not from research papers but directly from other books. And in the absence of space for full development it appears more as opinion than as derived results.

One example of this in the section on aerosol of marine origin is the paragraph devoted to "mirror spots" or "biofilms" in the marine zone. The English language literature would describe them as "slicks" on the sea. The paragraph and accompanying photograph constitute almost one per cent of the book, indicating that the author attaches some importance to it. Indeed the effect of surface films on the sea may be to significantly change the composition of sea salt aerosol, enhancing the sea-to-land transport of both calcium and fixed nitrogen. But in their compressed form they produce the appearance

of slicks by damping capillary waves through surface viscosity, not by changing the surface tension as stated by Professor Israel. And the inhibition of evaporation by films occurs principally with pure films of long chain alcohols and fatty acids, not with the mixed films which are found on the sea, most of which are in any case likely to be composed of proteins.

We cannot know whether the author believed that nitrogen and oxygen are truly unchanging in the atmosphere, although his inclusion of oxides of nitrogen among the variable gases suggests that he did not. One omission is the book's treatment only of the petty cycles which quickly turn over small quantities of atmospheric components. The grand cycles of nitrogen and oxygen and the net upward transport of hydrogen which maintain the atmosphere in a chemical state congenial with life but out of equilibrium with crust and ocean could not be ignored in a modern work. That phenomenon, which has been incorporated under the name Gaia in a cybernetic view of the atmosphere by Lovelock and Lodge, must be viewed as the background against which all petty cycles turn.

The book has a significant number of typographical errors and misprints, some of which amount to malapropisms. The most interesting cartographic innovation, which occurs on page 61, finally liberates Cornwall from the English mainland. The layout and print are generally good.

I could not recommend the book as an introduction to the chemistry and physics of air, gases and particles, for the effect is not to leave a vivid and valid impression of some of the fundamentals. Fully-fledged workers in the field will already have on their bookshelves the books by Mason, Junge, Fletcher and others covering the ground rigorously. There is a place for a book on this scale which will brief the newcomer to the field on some of the ways of the atmosphere but unfortunately this is not that book.

M. P. Patterson

Reader Enquiry Service No. 7507

### 110th Annual Report on Alkali, & c. Works 1973

*Department of the Environment, Scottish Development  
Department Welsh Office. H.M.S.O. 91p.*

On the 1st January 1975 the Alkali and Clean Air Inspectorate will lose its individual identity and be merged with the other inspectorates into one new executive body. Some sections of the Alkali Act will be repealed on the same date and replaced by regulations; the remainder of the Alkali Act will be repealed and replaced by regulations on 1st April 1975. So by the Spring of next year the Alkali Act which has done so much for clean air in this country, and which will have been in force in one form or another for some 112 years will no longer be on the Statute Book. It is not yet known exactly what form the new regulations will take, but it is known that the philosophy of the "best practicable means" will be retained.

"One is left wondering how much this transfer may weaken the team . . . let us hope that the new body is as successful as its creators have planned and that it is at least as effective as the systems it will replace," as Mr. Ireland stresses in this report.

In defence of the clause "the best practicable means" around which policy the Alkali Inspectorate has evolved,

Mr. Ireland says "It is ageless" and "can always be modern if it is used properly".

"Inherent in our policy is the thesis that there are no such things as harmful materials, there are only harmful concentrations."

The basic needs for good control of emissions are "(a) the setting of standards and other requirements, (b) prior approval of appliances, (c) continuing routine inspection and testing, and (d) recourse to legal action when works misbehave in a way that deserves public punishment." Mr. Ireland firmly believes that the "best practicable means" clause under the Alkali Act contains all these elements and more. It must be stressed that Economics are an important part of the word "practicable" in this.

The number of works registered under the Act at the end of 1973 was 2,158, involving the operation of 3,197 processes. The total number of visits and inspections during 1973 was 568 more than in 1972, a total of 13,680. Of these 331 were to unregistered works and 49 concerned with radio active emissions. Members of the new testing teams made 807 visits to works, where they carried out 118 tests for grit and dust, 876 tests for fume and 617 of a chemical nature.

In 1973 there was a significant reduction in total registered processes under complaint and an even greater proportional reduction in non-registered processes investigated, compared with 1972.

Complaints against registered works were most numerous against mineral works (90) and against non-registerable works, general chemical works, animal waste processing plants and foundries.

The Report is once again a highly commendable piece of sound technical literature, essential reading for those in relevant local government positions, industry and environmental educational roles. There is, however, an undeniable sadness of tone throughout Mr. Ireland's report, a feeling of apprehension about the future of the Alkali Inspectorate in its forthcoming new merger with other organizations concerned with Works Inspection. Let us hope Mr. Ireland's apprehension is ill-founded.

Reader Enquiry Service No. 7508

### New additions to the National Society for Clean Air Library, available on Loan

**Extraction of Minerals and Energy.** Raul A. Deju. Ann Arbor Science Publications Inc.

**Dust Control and Air Cleaning.** International Series of Monographs in Heating, Ventilation and Refrigeration, Vol. 9. R. G. Dorman. Pergamon Press. 1974. £18.00.

**Pollution: Engineering and Scientific Solutions.** Edited by E. S. Barrekette. Environmental Science Research Series Vol. 2. Plenum Publishing Co. Ltd. 1974.

**Models for Environmental Pollution Control.** Edited by Rolf R. Deinurger. John Wiley & Sons Ltd. 1974. £13.50.

**Industrial Waste: Its Handling, Disposal and Re-Use.** A. W. Neal. Claude Gill Books. 1971. £3.00.

**Problems of the Environment.** Peter F. Brooks. Harrap Books. 1974. £2.85.

**Health Aspects of Environmental Pollution Control: Planning and Implementation of National Programmes.** WHO Technical Report Series. 1974.

**APHI Environmental Health Congress. October 1974 Torbay.** Proceedings of Conference.

**Trace Elements in the Atmosphere.** Hans Israel and Gerhard W. Israel. Ann Arbor Science. 1974. 158 pages.

**110th Annual Report on Alkali &c. Works 1973.** Department of the Environment, Scottish Development Department, Welsh Office, H.M.S.O. 91p.

**H.M. Chief Inspector of Factories Annual Report 1973.** Department of Employment. H.M.S.O. £1.10.

**Health Aspects of Environmental Pollution Control: Planning and Implementation of National Programmes.** Report of a WHO Expert Committee. WHO Technical Report Series. 1974. No. 554. 57 pp. Sw Fr.6.

**Environmental Health Report 1973.** The Association of Public Health Inspectors. H.M.S.O. 50p.

**Solid Smokeless Fuels Federation Annual Report 1973/4.**

**A Critical Review of Regulations for the Control of Sulfur Oxide Emissions, Particulate Emissions.** APCA Critical Reviews. Edited by H. M. Englund and W. T. Beery. APCA 1974.

**Control Technology: Particulates.** APCA Reprint Series. Edited by H. M. Englund and W. T. Beery. Air Pollution Control Association 1973.

**Population and the Quality of Life in Britain.** Conference Proceedings. Royal Society of Arts. 1973. 50p.

**Aspects of Pollution Associated with the Process Industries.** D. H. Napier. A Keith Shipton Developments Special Study. Published in association with Woodhead-Faulkner Ltd.

**Central Electricity Generating Board Annual Report and Accounts 1973-74.**

**Central Electricity Generating Board Statistical Yearbook 1973/4.**

**The Electricity Council Annual Report 1973-74.**

**National Coal Board Report and Accounts 1973-74.**

**National Coal Board Statistical Tables 1973/4.**

**British Gas Corporation Annual Report and Accounts 1973-74.**

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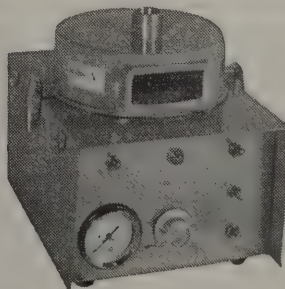
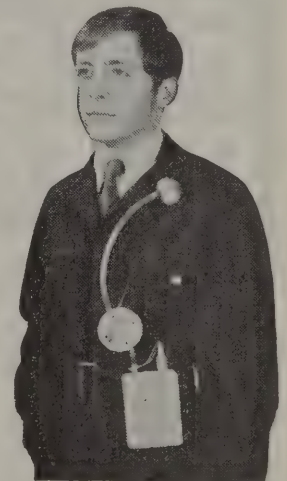
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# SMOKE CONTROL AREAS

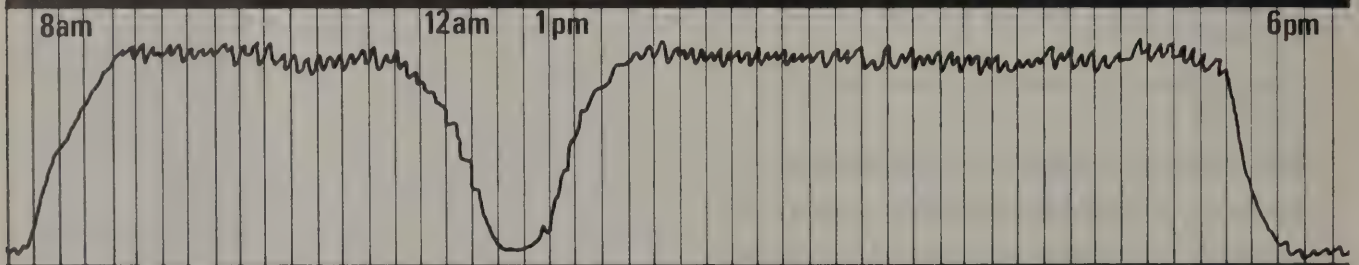
## Progress Report

Position at 30th September 1974

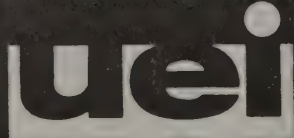
(Figures supplied by the Department of the Environment, The Welsh Office, The Northern Ireland Ministry of Development and the Scottish Development Department).

	England			Wales			Scotland			Northern Ireland		
<b>Smoke Control Orders Confirmed prior to 30.9.74</b>	4,396	1,384,741	6,219,081	19	2,855	10,499	238	128,391	550,219	58	14,108	34,456
Acres .. .. .												
Premises .. .. .												
<b>Smoke Control Orders Confirmed (30.6.74-30.9.74)</b>	33	14,824	46,515	—	—	—	3	2,028	988	1	154	426
Acres .. .. .												
Premises .. .. .												
<b>Totals .. .. .</b>	<b>4,429</b>	<b>1,399,565</b>	<b>6,265,596</b>	<b>19</b>	<b>2,855</b>	<b>10,499</b>	<b>241</b>	<b>130,419</b>	<b>551,207</b>	<b>59</b>	<b>14,262</b>	<b>34,882</b>
<b>Smoke Control Orders Submitted (30.6.74-30.9.74)</b>	23	18,502	72,328	—	—	—	—	—	—	1	473	2,238
Acres .. .. .												
Premises .. .. .												
<b>Grand Totals .. .. .</b>	<b>4,452</b>	<b>1,418,067</b>	<b>6,337,924</b>	<b>19</b>	<b>2,855</b>	<b>10,499</b>	<b>241</b>	<b>130,419</b>	<b>551,207</b>	<b>60</b>	<b>14,735</b>	<b>37,120</b>
<b>Smokeless Zones (Local Acts) in Operation ..</b>	44	3,400	41,060	—	—	—	—	—	—	—	—	—
Acres .. .. .												
Premises .. .. .												

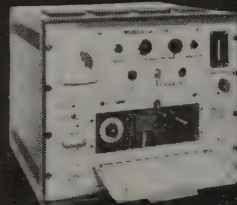
# For continuous monitoring of toxicity...



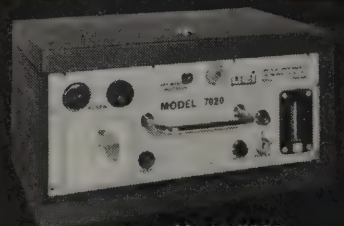
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# New Smoke Control Orders

The lists below are supplementary to the information in the last issue of **Clean Air (Autumn 1974)** which gave the position up to **30 June 1974**. They now show changes and additions up to **30 September 1974**.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

As from 23 September 1974, the distinction between "black" and "white" areas has been discontinued. Because of this, the table showing the smoke control position in regions of England has been temporarily discontinued.

## ENGLAND NEW SMOKE CONTROL ORDERS IN OPERATION

### Northern

Blaydon U.D. (No. 6), Gateshead C.B. (No. 14), Gosforth U.D. (No. 5), Hartlepool C.B. (No. 24), Hebburn U.D. (No. 15), Newburn U.D. (No. 20), Saltburn and Marske-by-the-Sea U.D. (No. 4), Sunderland C.B. (No. 12), Teesside C.B. (No. 15), Tyne-mouth C.B. (Nos. 15, 16 and 17), Whickham U.D. (Nos. 14 and 15).

### North Western

Altrincham B.C. (No. 12), Ashton-under-Lyne B.C. (No. 16), Barrowford U.D. (No. 6), Bebington B.C. (Nos. 17 and 26 [2]), Birkenhead C.B. (Nos. 16 and 18), Blackburn R.D. (Nos. 3 and 4), Blackburn C.B. (No. 14), Bootle C.B. (No. 13), Brierfield U.D. (No. 7), Burnley R.D. (No. 2), Darwen B.C. (No. 12), Droylesden U.D. (No. 16), Dukinfield B.C. (Nos. 17 and 18), Eccles B.C. (No. 18), Great Harwood U.D. (No. 5), Hale U.D. (Nos. 4 and 5), Hazel Grove and Bramhall

U.D. (Nos. 9 and 10), Huyton-with-Roby U.D. (No. 9), Hyde B.C. (No. 9), Leigh B.C. (Nos. 14 and 15), Manchester C.B. (Crumpsall), Middleton B.C. (No. 21), Oldham C.B. (No. 20), Oswaldtwistle U.D. (No. 5), Preston R.D. (Penwortham No. 1), Prestwich B.C. (Nos. 10A and 12), Radcliffe B.C. (No. 8), Ramsbottom U.D. (No. 7), Rawtenstall B.C. (No. 7), Rochdale C.B. (Townhead and Whitworth Road), Runcorn R.D. (No. 7), Stockport C.B. (Shaw Heath/Cale Green, South), Swinton and Pendlebury B.C. (Nos. 8 and 9), Tyldesley U.D. (No. 5), Warrington R.D. (Nos. 9 and 10), Whiston R.D. (Halewood No. 2), Widnes B.C. (No. 11), Wigan C.B. (Nos. 11 and 12), Wilmslow U.D. (No. 13), Worsley U.D. (No. 13).

### Yorkshire and Humberside

Barnsley C.B. (Nos. 18, 19 and 20), Batley B.C. (Nos. 8 and 9), Bradford C.B. (North and East), Doncaster C.B. (No. 14), Halifax C.B. (Nos. 19 and 20), Harrogate B.C. (No. 4), Hebden Royd U.D. (No. 2), Heckmondwike U.D. (No. 10), Horsforth U.D. (Nos. 34 and 35), Hoyland Nether U.D. (No. 3), Huddersfield C.B. (Fartown-Brackenham), Leeds C.B. (Nos. 108, 109, 112, 113 and 114), Newcastle-under-Lyme (No. 9), Roth-erham C.B. (Wellgate), Royston U.D. (Yorks WR No. 3), Skipton R.D. (Sutton No. 2), Skipton U.D. (No. 9), Stanley U.D. (Yorks No. 6), Swinton U.D. (No. 15), Todmorden B.C. (No. 10), Wakefield C.B. (Denby Dale Road No. 1), Lupset No. 1, St. John's No. 2, Sandal No. 4, and Thornes Lane No. 2), Worsbrough U.D. (No. 1), York C.B. (No. 3).

### West Midlands

Aldridge/Brownhills U.D. (No. 36), Burton-on-Trent C.B. (No. 4), Coventry C.B. (No. 17), Lichfield C.B. (Nos. 1 and 2), Seisdon R.D. (No. 3), Solihull C.B. (No. 18), Stoke-on-Trent C.B. (No. 28), Stourbridge B.C. (Nos. 32 and 33), Sutton Coldfield B.C. (Nos. 28, 29 and 31), Walsall C.B. (Nos. 16, 17 and 18), Wolverhampton C.B. (Nos. 17, 18 and 19).

### East Midlands

Alfreton U.D. (No. 9), Arnold U.D. (No. 5A), Belper R.D. (No. 4), Blaby R.D. (No. 8), Blackwell R.D. (No. 2),

Chesterfield B.C. (No. 7), Dronfield U.D. (No. 8), Heanor U.D. (No. 4), Hucknall U.D. (No. 5), Ilkeston B.C. (No. 9), Lincoln C.B. (No. 8), Nottingham C.B. (No. 6).

### East Anglia

Cambridge B.C. (No. 3).

### Greater London

Bromley L.B. (Nos. 19, 20, 21 and Penge East), Croydon L.B. (No. 15), Enfield L.B. (No. 19), Harrow L.B. (No. 28), Hillingdon L.B. (Nos. 23 and 24), Lambeth L.B. (No. 28), Merton L.B. (No. 26), Southwark L.B. (Nos. 29 and 30), Sutton L.B. (No. 28), Waltham Forest L.B. (Nos. 19 and 20).

### Eastern

Thurrock U.D. (No. 10).

### South East

Guildford B.C. (No. 1), Waltham Holy Cross U.D. (No. 7), New Windsor R.B. (No. 3).

### South West

Exeter C.B. (Bedcorn Heath and Hamlin Gardens).

## NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

### Northern

Newcastle upon Tyne (Nos. 19, 20, 21, 22, and No. 21 Newburn).

### North West

Bury (Tottington No. 5), Trafford (Altrincham No. 13).

### Yorkshire and Humberside

Leeds (Nos. 121 and 122).

### East Midlands

Bassetlaw (Worksop No. 4), Mansfield D.C. (No. 1), Newark D.C. (No. 4).

### West Midlands

Dudley (No 132 Kates Hill), Rugby (No. 17), Walsall (No. 21 Pelsall and No. 22 Aldridge Consolidation).

### London Boroughs

Brent (No. 14), Bromley (No. 33), Kingston-upon-Thames (No. 24), Lambeth (No. 30).

### South East

Epping Forest D.C. (Loughton No. 1), Portsmouth (No. 2), Spelthorne (No. 13).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

### Northern

Saltburn and Marske-by-the-Sea (Nos. 6, 7 and 14), Workington (Harrington No. 3).

### North West

Bolton (Halliwell and Westwards), Darwen (No. 14), Horwich U.D.C. (No. 7), Lees (Nos. 2 and 3 North Ward and No. 4 South Ward), Preston B.C. (No. 29), Swinton and Pendlebury (Nos. 10 and 11), Widnes B.C. (No. 15).

### East Midlands

Bassetlaw D.C. (Workshop Area No. 4 Hemmingfield, Prospect), Chesterfield B.C. (No. 9 St. Thomas), Gedling D.C. (No. 1), Kirby-in-Ashfield (No. 9), Worksop (No. 3).

### West Midlands

Market Drayton (No. 13), Rugby (No. 16), Shrewsbury B.C. (No. 2), Walsall (No. 20 New Invention), Warwick (No. 1).

### London Boroughs

Bexley (No. 14), Bromley (Nos. 23 and 33), Harrow (Nos. 30 and 31), Merton (No. 29).

### South East

Brighton (No. 1), Gravesend (No. 3), Southampton (No. 15 West Quay), Thurrock U.D.C. (No. 11).

### NORTHERN IRELAND NEW SMOKE CONTROL ORDERS IN OPERATION

Newtownabbey U.D.C. (No. 8), Antrim R.D.C. (No. 3).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Craigavon B.C. (No. 3).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Castlereagh D.C. (No. 1).

### SCOTLAND

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Clydebank (Central), Paisley (North End), Dunbarton County (Old Kilpatrick).

### WALES

### SMOKE CONTROL ORDER WITHDRAWN

Wrexham C.B.



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## Diary of Events 1975

### 14th Jan. (Tues)

14.15 Meeting of Conference and Publicity Committee.

### 24th Jan. (Fri.)

Copy date for Spring "Clean Air".

### 19th Feb. (Wed.)

11.15 Meeting of Parliamentary and Local Government Committee.

14.15 Meeting of Technical Committee.

### 5th March (Wed.)

14.15 Meeting of General Purposes and Finance Committee.

### 18-20th March

Clean Air Spring Seminar, Newcastle upon Tyne.

### 27th March (Thurs.)

East Midlands Divisional Meeting at Derby.

### 9th July (Wed.)

Annual General Meeting.

### 20-24th October

Clean Air Conference, Brighton.

# AIR POLLUTION ABSTRACTS

## *Papers presented to the 41st Annual Conference of The National Society for Clean Air 14-18 October 1974*

**1327 New Legislation Affecting the Environment and its Implications and Effects.** W. Bate, M.B.E. (City of Cardiff, City Environmental Health Officer).

Great progress is foreseen with the 'Control of Pollution Act', in the Bill stage now. This is the first Act made directly against various forms of pollution. It will impose new duties and greater responsibilities on county councils, district councils and water and river purification authorities. For it alters their roles and changes the relationship between local authorities and the Alkali Inspectorate. The Act, once made law, will have a profound impact on those in trade, commerce and industry.

The author describes the Bill in sections related to the individual pollution factors covered, and discusses in detail the implications, problems and aims.

In conclusion it is made obvious that this new Act will place high demands on all those involved in local government and industry. It is unquestionably the broadest based, protective legislation yet devised in this country, to improve and save our environment.

**1328 Environmental Pollution: The Technical Aspects of Co-operation between Industry and the Local Authority.** Dr. R. Jenkins (B.P. Chemicals International Ltd.).

The author discusses the growing necessity of early consultations between the industrialist and outside statutory bodies on aspects of environmental pollution. This is related to B.P.C.I.'s large and rapid expansion at the Baglan Bay complex which covers a wide range of chemicals, posing different environmental problems from the more traditional industries.

The problems manifested by such developments will have both short-term and long-term effects, which industrialists alone are incapable of tackling; especially since statutory requirements and society's standards of pollution control are at present changing rapidly.

Systematic monitoring of atmospheric pollution (even prior to plant construction), over a long time scale is essential, since air pollution can vary significantly with the seasons of the year and climatic conditions and noise with the time of day.

Investigations at source by the Alkali Inspectorate and measurement of pollution in community areas by the Public Health Department are essential and complementary, but not without practical difficulties.

**1329 Environmental Pollution: Road Traffic: (a) The Propagation and Screening of Traffic Noise.** Written by W. E. Scholes; presented by T. W. Heppell (Department of the Environment, Building Research Establishment).

Recent regulations in the U.K. have made provision for the sound insulation of dwellings which become exposed to a certain level of noise from traffic using new or improved roads. For such a scheme to be viable and also for planning purposes it is essential that techniques are available for the prediction of traffic noise in a wide range of situations. This paper discusses the physical factors which influence the propagation of noise outdoors and which must be taken into account in devising noise prediction procedure for use by planners and highway authorities. Since some of the several factors affecting outdoor propagation interact and are individually complex and variable, it is necessary to make broad simplifications to derive standard prediction procedures.

An outline is given of the current Building Research Establishment prediction technique and some results are presented of experiments on full-scale noise barriers which have been carried out to provide and improve design guidance.

Improvement to building insulation can give large reduction in noise propagating from a road to the inside of a dwelling. The outcome of recent work to sound-insulate a flat, involving special ventilation and solar control devices is discussed.

From the results it seems likely that the most important factor for further studies of traffic pollution will be the significance of hydrocarbons and oxides of nitrogen from this source for production of secondary pollutants.

**1330 (b) Preliminary Findings of the Five Town Survey.** Dr. R. G. Derwent and Dr. H. N. Stewart (Department of Industry, Warren Spring Laboratory).

The combustion of hydrocarbon fuels, whether in static installations or in the engines of motor vehicles, inevitably gives rise to atmospheric pollution. In fixed installations the discharge products are normally high enough to avoid high concentrations at ground levels, but for vehicle exhaust emissions this is not true. Pollution of the latter kind will be influenced by vehicle flow density and the effect of buildings in restricting ventilation (at ground level).

The Warren Spring Laboratory in 1967/9 measured carbon monoxide concentrations in U.K. city streets, but in 1972 was asked by the Department of the Environment to make further measurements of a wide range of pollutants in five cities over five years, which will cover seasonal and climatic variations and detect any significant trends. The sites chosen are London, Cardiff, Birmingham, Glasgow and Cambridge. Extensive tables and diagrams are used to summarise the methods used.

The site at Cardiff is examined in detail due to the local interest of this conference, and as a tribute to the indispensable service of the Cardiff Environmental Health Department.

**1331 The Prevention of Pollution from Industry: (a) The Coal Industry.** D. H. Broadbent (National Coal Board).

The paper seeks to illustrate the chain of events which were "sparked off" by primitive man's first fire-lighting activities ranging from such seemingly disconnected happenings as

the Industrial Revolution, smog in both London and Los Angeles and an energy crisis.

To sustain the anticipated world population of 6 billion by the year 2000, greater industrialisation is necessary; it is ironic that in meeting these increased energy demands we are in danger of causing further problems in the environmental and pollution fields.

Over the last two decades great progress has been made in reducing smog, both here and in Europe; legislation has been passed relating to air and the environment and relates to domestic and industrial smoke abatement.

**1332 (b) The Steel Industry.** Dr. A. O'Connor (British Steel Corporation).

Using tables and diagrams of averages the author deals with pollution from the iron and steel industry generally, but stresses air pollution aspects. Reference is made specifically to the Strip Mills Division of the B.S.C.

Atmospheric emissions and liquid effluents are dealt with systematically in association with the main stages in processing. Waste disposal is discussed in terms of amount and usage, and noise abatement with relevant equipment.

Interesting stress is laid on secondary sources of pollution, since these become more obvious as main pollution sources are controlled. Such secondary sources do much to underline the general public's confidence and hence the industry's substantial achievements in pollution control. The necessary capital expenditure required in this industry for pollution control to current standards is obviously high, at least 10% of the total capital expenditure on a new plant.

The fact that there are many potential sources of extensive pollution in the iron and steel industry is not

denied. Recent changes in process technology and increasing use of pollution control measures are at present having the required beneficial effect. However, a point is being reached where technological problems in this field will represent a major challenge.

**1333 Measurement of Heavy Metals in the Atmosphere and their Interpretation.** N. J. Pattenden (Environmental and Medical Sciences Division, A.E.R.E., Harwell).

The work described in this paper is due to the team of R. S. Cambray, P. A. Cawse, D. H. Peirson, L. Salmon and the author. The measurements have been sponsored by the Welsh Office and the Natural Environment Research Council to whom thanks are expressed.

With the use of tables and diagrams the paper describes measurements of the concentrations of heavy metals and other elements in suspended airborne dust and in dust deposited dry and in rain. The samples have been collected mainly at stations in Britain. The paper includes a discussion on the methods of sampling, and some elementary principles involved therein. It does not include a description or discussion of the methods of analysis. A description of some particle size measurements is given.

The sampling methods are illustrated with results obtained mainly at Trebanos, near Swansea, and some comparisons of these results with measurements elsewhere are made. Some interpretive remarks are made on generalisations covering the whole country, which point to areas where further field-work could usefully be applied. For all the samples the analytical method has been mainly instrumental neutron activation analysis. This has been supplemented by X-ray fluorescence for nickel and lead, and in the case of solutions by colorimetric methods for copper and lead

and atomic absorption spectrophotometry for nickel.

**1334 The Use of Moss-Bags as Deposition Gauges for Airborne Metals.** Prof. G. T. Goodman, S. Smith, G. D. R. Parry and M. J. Inskip (Department of Applied Biology, Chelsea College, University of London). Presented by Prof. G. T. Goodman.

With the use of graphs and tables, and isopleth diagrams, this paper emphasises the need to monitor environmental burdens of metals, as rising metal trends in air, soils, tissues of plants, animals etc. can prove very damaging to human life. Such monitoring can help predict possible future hazards to man before he is affected. The measurements should reflect routes to man and their supply rates: directly into the lung by inhalation; via food and drinking water.

The individual and comparative advantages and disadvantages of the four most commonly used deposit gauges for this purpose are discussed in great detail namely the Total Deposit Gauge TD; Dry Deposit Gauge DD; Moss-Bag MB, and the AERE Air Concentration Gauge AC. Experiments are discussed with particular reference to Wales.

The results indicate that the moss-bag is a useful, inexpensive, semi-quantitative indicator of metal pollutant levels and can be used to monitor changes in airborne metal burdens in space and time. However, further studies to include wind direction and strength; and rainfall measurements are necessary to confirm the reliability of the moss-bag to index metal input to grass. Such experiments would seem likely to further validate the horizontal moss-bag as a fairly accurate deposition gauge and the vertical bag as an indicator of emission sources.

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GRIT, DUST AND FUME**

at

**GOSFORTH PARK HOTEL  
NEWCASTLE-UPON-TYNE**

on

**18th, 19th and 20th MARCH 1975**

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BRIGHTON BN1 1RG.**

**Tel: Brighton 26313.**



The Central Electricity Generating Board have over a period of more than 15 years gradually and progressively improved methods of solid and liquid fuel combustion which has resulted in reduced emissions and better dispersion of effluent by fewer but higher chimneys. During this time much basic research on power station development has been carried out and emphasis has been placed on cleaner air and improved instrumentation for measurement of emissions and monitoring.

***Clean power for the people***



"Air Knows No Frontiers"

# INTERNATIONAL NEWS

## GERMANY

### Air-Pollution Monitoring

In Baden-Württemberg, in south-west Germany, the first overall, supraregional, air-pollution monitoring network is taking shape. Siemens has received the order for the first three fully automatic air-pollution-monitoring stations from the Landesanstalt für Arbeitsschutz und Arbeitsmedizin, Immission- und Strahlenschutz, in Karlsruhe, and these are to be set up within the framework of the smog-warning system in the industrial agglomeration of Heidelberg-Mannheim-Ludwigshafen-Frankenthal. The monitoring stations automatically register the most important meteorological data and pollution levels and transmit them by supervisory remote-control equipment to a regional subcontrol centre in Mannheim where they are analysed by a Siemens 320 process computer. Further subcontrol centres and a Siemens 330 process computer for the main control centre in Karlsruhe are planned for a later stage.

The first three automatic air-pollution-monitoring stations, besides registering meteorological variables like solar irradiation, wind velocity and direction, air temperature, air pressure, and humidity, will measure the most important quality characteristics of the air we breathe. With built-in electric analysers the concentrations of  $C_mH_n$ ,  $CO$ ,  $CO_2$ ,  $SO_2$ ,  $NO_x$ , and  $O_3$  as well as those of dust are measured and converted into electrical signals proportional to the level of concentration. The monitoring stations are already prepared for the installation of a chromatographic measuring facility, so that later they will also be able to determine individual organic components in the air. This will probably involve a process chromatograph in conjunction with a storage-type proportioning device.

The system controlled by the Siemens 320 process computer in Mannheim also automatically evaluates the readings and performs such functions as working out averages from instantaneous values, storing and logging averages and calculating upward or downward trends. The subcontrol centre also initiates the daily routine check of the measuring instruments.

In the next few years, a total of 14 pollution-monitoring stations are to be installed and linked up to two regional subcontrol centres. Further subcontrol centres without process computers are planned for Heilbronn, Ulm and Freiburg. The main control centre in Karlsruhe will be responsible for sounding the alarm within the framework of the smog-warning scheme and for initiating the necessary countermeasures.

The resulting volume of data—about 5000 readings per sec—is reduced according to ecological criteria by the process computer and then transferred to the data files of the Landesanstalt.

## U.S.A.

### Jet Pollution Levels

Jet-aircraft pollution in the world's airlines will be measured under a contract awarded to United Air Lines, Chicago, by NASA. Under the contract, United Air Lines will develop, test, and fly a system on one of its 747 jumbo jets that can measure dust particles and gases in the airlines. Flights will be made over the contiguous U.S. and Hawaii.

Porter J. Perkins, manager of the Global Air Sampling Programme (GASP) at NASA's Lewis Research Centre in Cleveland, said results should reveal to what extent, if any, jet-aircraft emissions affect the earth's natural atmosphere. The survey may reveal any changes in the level of ozone, which shields us from solar ultraviolet radiation, as well as how much jet vapour trails contribute to cloud cover and what proportion of dust particles in the airlines is from aircraft.

NASA selected the Boeing 747 jet to carry the instruments because of its wide body and its modern air-data-computing system that records such information as location, altitude, air temperature, and airspeed. Air-sampling equipment is automatically activated once the plane achieves the proper flight altitude. A small tube protruding from the underside of the plane's nose takes in air for analysis. Initially the 747s will carry instruments that can detect four constituents: total suspended particles (dust particles), carbon monoxide, ozone, and water vapour. Later in the programme, as many as 10 instruments may be carried. GASP scientists are especially interested in obtaining data on oxides of nitrogen emitted by jet engines. Oxides of nitrogen interact with ozone and destroy it in the vapour atmosphere. If not enough ozone is present, harmful ultraviolet rays are not filtered out.

Information obtained on atmospheric constituents sampled in the lower stratosphere (20,000 to 40,000 ft.) will be made available by NASA to those interested in pollution effects. NASA will be working closely with the National Oceanic and Atmospheric Administration to correlate results of the study with weather data and assess the effects of man-made pollutants on the atmosphere. The Department of Transportation will use the information as part of its Climatic Impact Assessment Programme.

# The Control of Pollution Act

## In Relation to the Control of Air Pollution

Paper presented to the London and South East and Central  
Southern Divisions of the National Society for Clean Air  
on 24th September 1974

by

Mr. T. H. Iddison, FAPHI, FRSH

The first major difficulty in preparing these notes for your consideration, was to obtain a copy of the Act in sufficient time to prepare some comments. My difficulty in this connection will have been shared by others attending this meeting but I hope that on the whole we have obtained sufficient information to provide a basis for a profitable discussion.

I propose to say nothing about Part 2 of the Act which deals with pollution of water and very little about Part 1 which is in relation to waste on land.

One would hope that the changes that have taken place in relation to refuse disposal arising out of Local Government, would already be resulting in a reduction in the number of uncontrolled tipping sites and included in them some of the sites in which tipping and incineration have, by accident or design, been combined. The provisions of the Act should go some way in accelerating this process. For quite a number of years the Society has been receiving representations from various bodies and individuals in relation to the nuisance which arises from the burning of garden refuse.

In the Warren Spring Report upon Air Pollution in the south-east, comment was made in relation to the smoke that was seen to be arising on summer evenings when one looked down upon certain areas of London and its environs.

In view of the changes that are taking place, and that will take place arising out of this recent enactment, it is interesting to look at some of the comments which were made by the Society in its memorandum to the Working Party on Refuse Disposal in 1968. There it was said that "The scope of the Public Cleansing Service in Smoke Control Areas should be such as to eliminate the need for the disposal of refuse in small amounts at domestic, commercial and industrial premises. That the disposal of refuse, including old motor cars, other than by local authorities, should only be permitted in plants or on sites licensed by the local authority under an extension of the Clean Air Act. That local authority and other disposal plants and sites should comply with a code designed to eliminate emission of smoke, dust and fumes either during the handling of material or during combustion." The failure of the general acceptance of a comprehensive collection arrangement may well lead to a continuance of householders disposing of garden and other refuse by burning. "Collection arrangements made at a charge to deal with arisings at commercial and small industrial establishments, could eliminate attempts to burn refuse at these premises where it is most difficult to carry on this means of disposal, without conflict with clean air principles. The disposal of old motor cars presents special hazards as the usual practice is to dispose of tyres and to remove upholstery, etc. by burning

in the open, and finally the Society believe that the need for the elimination of smoke, dust and fume nuisances justifies the registration or licensing of all these disposal units by the local authority."

As I see it, the Control of Pollution Act contains provisions which either deal with all these matters or have a potential for dealing with them. Section 1 of the Act is a very wide and all-embracing section; it places a duty on each disposal authority to ensure that the arrangements made by the authority and other persons for the disposal of waste are adequate for the purpose of disposing of all controlled waste which becomes situated in its area after this section comes into force. Obviously the first question we have to ask ourselves is, what is 'controlled waste', and turning to Section 30, Sub-section 1, we find that it means household, industrial and commercial waste or any such waste. Taking this a stage further we turn to Section 30, Sub-section 3, where we find that household waste consists of waste from a private dwelling or residential home, or from premises forming part of a university, or school, or other educational establishment, or forming part of a hospital or nursing home. In the absence of any guidance to the contrary, I would therefore venture the opinion that garden waste is waste from a private dwelling and as such is part of household waste and part of controlled waste. Industrial waste and commercial waste are also defined. There would appear to be a duty upon disposal authorities to make provision for disposal of household waste and therefore garden waste. However, in Section 30, Sub-section 4, it is stated that regulations may provide that waste of a prescribed description shall be treated, for the purposes of prescribed provisions of this part of this Act, as not being household waste or industrial waste or commercial waste. The same freedom for manoeuvre is to be found in the provisions in relation to the collection of controlled waste. In Section 12 it is stated that it should be the duty of each collection authority to arrange for the collection of all household waste in its area, with certain exceptions. Garden refuse is not included in the exceptions. It is, however, stated that no charge shall be made for the collection of household waste in pursuance of these provisions except in prescribed cases. There is, therefore, the possibility that garden refuse could be a prescribed case in relation to collection and that it could be subject to regulations in relation to its disposal.

Generally speaking, the disposal of refuse, whether by controlled tipping or by incineration, will require the person or body disposing of the refuse to do so by means of a licence. The licence will be issued in England by the County Authority. Section 9 states that it should be the duty of the authority which issued the licence to take steps needed to ensure, amongst other things, that the

activities to which the licence relates do not cause danger to public health or become seriously detrimental to the amenities of the locality affected by the activities. These activities could, of course, include the incineration of refuse and this incineration could give rise to nuisance either by deposits of grit or emission of smoke, etc. If the incineration of refuse resulted in nuisance, one would assume that the District Council would be in the position of having a statutory duty to ensure that the nuisance was abated. The very fact that there was a nuisance would be an indication that the County Authority had not carried out its duty and might therefore be regarded as the body by whose act, default or sufferance the nuisance arose or continued. In these circumstances the District Council might have to consider whether it should take enforcement action against the County Authority. To take action against the Licensee might result in the County Authority being asked to give evidence for the Licensee. What is clear is that a very close liaison will have to be established between the officers of the County Authority and those of the District Council in relation to this particular provision.

Having in these introductory remarks dealt with the air pollution aspects of waste disposal, it would now be logical to proceed to Part 4 of the Act which deals with matters of air pollution. Section 75 gives the Secretary of State power to make regulations imposing requirements as to the composition and contents of any kind of fuel used in motor vehicles. This Section, which empowers the making of regulations, requires that the Secretary of State shall consult such persons as appear to him to represent manufacturers and users of motor vehicles, such persons appearing to him to represent the producers and users of fuel for motor vehicles and such persons appearing to him to be conversant with problems of air pollution as he considers appropriate. The duty of enforcing this section is placed upon the Consumer Protection Departments. The following Section gives power to the Secretary of State to make regulations imposing limits on the sulphur content of oil fuel which is used in furnaces or in engines. The same requirements as to consultation are again imposed. In this instance the duty of enforcement is placed upon Local Authorities except in relation to a furnace which is part of a work subject to the Alkali Act. These are relatively straightforward Sections, the purpose of which is quite obvious. Section 78 amends previous legislation regarding metal recovery in that a person who burns insulation from cable with a view to recovering metal from the cable, is guilty of an offence unless the place at which he does so is a works registered in pursuance of Section 9 of the Alkali Act. In this instance, enforcement will lie with the Alkali Inspectorate. During the last few years, one has seen instances of small businesses where relatively small quantities of cable were being burnt and which resulted in emission of black smoke. These were, therefore, of concern both to the District Council's officers as well as to the Alkali Inspectorate. One wonders whether in the case of the small operator it will always be easy to prove what might seem obvious, namely that the cable was being burnt with a view to recovering metal from it. Sections 79 to 83 inclusive, deal with the obtaining and dissemination of information about atmospheric pollution. They stem in the first place from the second report of the Royal Commission upon Environmental Pollution and in the second place from the Sharp Report. It will be recalled that the Royal Commission said they had been struck by the insistence upon confidentiality over the nature and quantities of industrial wastes released into the air or into rivers and estuaries or dumped on land or at sea. They expressed

doubts as to the reason for this confidentiality and stated that their doubts were shared by many of the witnesses from industry with whom they had spoken. They went on to say that it was in the public interest that information about wastes should be available, not only to statutory bodies which had a right to demand it, but to research workers and others who could make use of it to improve the environment. Arising out of consideration of this report the Clean Air Council set up a Working Party to consider information about industrial emissions to the atmosphere. In principle, if not in the absolute letter, the recommendations of the Working Party have been embodied in the Control of Pollution Act. The Working Party was led to believe if industrialists were to provide information about emissions they would wish that the way in which the information was finally released to the public should be to some extent within their control, and for this reason it was suggested that what were called 'Indemat' committees, should be set up to consider the information and arrange for its publication. On the 'Indemat' committees there would have been members of Local Authorities, industrialists and others, with a particular interest in, or special knowledge of, matters of air pollution. Whilst the Control of Pollution Act does not require the setting up of such Committees, it does require that Local Authorities exercising powers in relation to the obtaining of information and dissemination of that information, should from time to time, consult such persons carrying on any trade or business in the Authority's area, or such organisations appearing to the Authority to be conversant with problems of air pollution, about the way in which the Local Authority exercises its powers, and the extent to which, and the manner in which, the information collected should be made available to the public. These consultations are to take place from time to time as the Authority thinks necessary, but not less than twice in each financial year. Section 79 of the Act empowers Local Authorities to obtain information about the emission of pollutants and other substances in the air, either by issuing notices in accordance with the provisions of Section 80 or by measuring and recording the emissions, or alternatively by entering into arrangements with the occupiers of premises under which they will measure and record the emissions on behalf of the Local Authority. The Local Authority is not authorised to enter premises for the purpose of measuring and recording the emissions unless 21 days' notice of its intention has been given and the notice has specified the kind of emission in question, the steps it proposes to take on the premises for the purpose of measuring and recording the emissions and stating that it proposes to exercise that power for that purpose unless the occupier has made a request to the Authority for the service of a notice in accordance with the provisions of Section 80. The power to enter premises and measure and record emissions is not exercisable by a Local Authority in relation to works subject to the Alkali Act. Section 80 of the Act empowers a Local Authority to require the occupier of premises within its area to furnish information either by periodical returns or other means in relation to the emission of pollutants and other substances into the air from the premises. The section does not apply to premises which consist of a private dwelling. Information in relation to works subject to the Alkali Act, is only to be made available in so far as it is the sort of information which is being supplied to the inspector for the purposes of that Act. A person who has been served with a notice requiring him to supply information, has a right of appeal to the Secretary of State on certain defined grounds. The first is that the giving to the Authority or the disclosure to the public of all or part of the information

required would prejudice within a reasonable degree some private interest by disclosing information about trade secrets or that such disclosure would be contrary to the public interest. The second ground of appeal is that the information required by the notice is not immediately available and cannot readily be collected or obtained without incurring undue expenditure for the purpose. The provisions of Section 82 are all-important as they empower the Secretary of State to make regulations prescribing the manner in which, and the methods by which Local Authorities are to perform their functions in relation to the obtaining and dissemination of information. Whilst the power to make regulations is a general one, it is said in Section 82, Sub-section 3, that the regulations may, in particular:

- (a) Prescribe the kinds of emissions to which the notices may relate;
- (b) Prescribe the kinds of information which may be required by the notices;
- (c) Prescribe the manner in which any such notice is to be given, and the evidence which is to be sufficient evidence of its having been given and of its contents and authenticity;
- (d) Require each Local Authority to maintain in a prescribed form a register containing information obtained by the Authority in accordance with any of the means previously mentioned, other than information which is not to be disclosed to the public, and such information, if any, as the Secretary of State may determine. This register is to be open to public inspection at the principal offices of the Authority free of charge at all reasonable hours and the Authority must afford members of the public reasonable facilities for obtaining from the Authority on payment of reasonable charges, copies of entries in the register.

The regulations may also specify the circumstances in which Local Authorities may enter into arrangement with owners or occupiers of premises under which they will record measured emissions on behalf of the Authority and finally may specify the kinds of apparatus which Local Authorities are to have power to provide and use for measuring and recording emissions and for other purposes. The regulations prescribing the kinds of information which may be required may, in particular, require returns of the total volume of gases whether pollutant or not discharged from the premises in question over any period, the concentration of pollutant in the gases discharged, the total of the pollutant discharged over any period, the height or heights at which discharges take place, the hours during which discharges take place, and the concentration of pollutants at ground level. There is no doubt that in the past Local Authorities have experienced some considerable difficulty in obtaining information in relation to emissions from works subject to the provisions of the Alkali Act. The Alkali Inspectors have not felt that they were in a position to divulge this information and have felt moreover that such information should be provided directly by the industries concerned. The dates of operation of the various parts of the Control of Pollution Act are now being fixed, and once the Act is in operation and the regulations have been made, these difficulties should be resolved.

Some local authorities have been reluctant to admit to having an air pollution problem and still more reluctant to pay for producing evidence of its existence. Section 83

of the Act empowers the Secretary of State, for the purpose of obtaining information about air pollution, to direct a Local Authority to make such arrangements as may be specified in the direction, for the provision, installation, operation and maintenance by the Local Authority of apparatus for measuring and recording air pollution, and for transmitting the information so obtained to the Secretary of State. Where such direction is made, the Secretary of State is required to defray the whole of the capital expenditure incurred in providing and installing the apparatus. The cost of maintaining the apparatus would appear therefore to fall upon the Local Authority concerned.

The powers of a Local Authority to obtain information are extended by the provisions of Section 93 of the Act, which state that a relevant authority may serve on any person a notice requiring him to furnish to the Authority, within a period or at a time specified in the notice and in a form so specified, any information so specified which the Authority reasonably considers that it needs for the purposes of any function conferred on the Authority by this Act. This wide power is subsequently circumscribed in Sub-section 2 which states that provision may be made by regulations for restricting the information which may be required, and for determining the form in which the information is to be so required. Section 94 prohibits the disclosure of information relating to any trade secret. The maximum fine for failing to provide information is £400, with a similar fine in respect of the disclosure of information which relates to a trade secret. Whilst on the subject of fines it is interesting to note that the second schedule brings penalties imposed by previous legislation into line with *current* monetary values. In the present circumstances it would not have occasioned much surprise had provision been made to relate fines to the cost of living index.

A complaint by Authorities responsible for the enforcement of the provisions of clean air legislation has been that due to long weekends and delayed postal deliveries etc. they have found difficulty in complying with the provisions of Section 30 of the Clean Air Act 1956 in relation to notification within 48 hours of offences against the Clean Air Act. This provision has now been amended in the Third Schedule Clause Sixteen in order to substitute a period of four days for the previous period of 48 hours.

I would now like to consider for a short time the provisions of Part Three of the Act in relation to noise, which these days is becoming more and more regarded as a form of air pollution. The provisions of this part of the Act replace and considerably extend the provisions of the Noise Abatement Act 1960. Section 58 states, where a Local Authority is satisfied that noise amounting to a nuisance exists or is likely to occur or recur in the area of the Authority, a notice shall be served imposing all or any of the following requirements—

- (a) Requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence.
- (b) Requiring the execution of such works and the taking of such other steps as may be necessary for the purpose of the notice or as may be specified in the notice. The notice is to be served upon the person responsible for the nuisance or if that person cannot be found, on the owner or occupier of the premises from which the noise is emitted or would be emitted.

Coupled with this power to deal with nuisance from noise

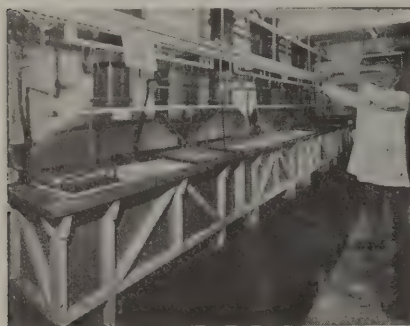
is a duty placed upon every Local Authority by the preceding Section to cause its area to be inspected from time to time to detect anything which ought to be dealt with under Section 54 and to decide how to exercise its powers concerning noise abatement zones. When the Act comes into operation this will be a duty of every Local Authority. A matter which will require urgent attention, if it has not already received attention, will be the giving of consideration to the needs both in relation to staff and equipment to carry out this duty satisfactorily. Section 53 reproduces similar powers to those of a Local Authority to take action in respect of noise amounting to a nuisance is set out in Section 54 but in this case the power is given to a Magistrates Court to act upon a complaint made by the occupier of any premises on the ground that in his capacity as occupier of the premises, he is aggrieved by noise amounting to a nuisance. It will be remembered that previous similar powers, both in Statute and in Byelaws required action by three householders. Sections 56 and 57 confer new and important powers in relation to action to be taken regarding noise from construction sites. Where it appears to a Local Authority that works involving the erection, construction, alteration, repair or maintenance of buildings, structures or roads, works of demolition, or any work of engineering construction, is being carried out *or is to be carried out*, the Local Authority may serve a notice imposing requirements as to the way in which the works are to be carried out, and may if it thinks fit, publish notice of the requirements in such a way as appears to them to be appropriate. The notice may in particular specify the plant or machinery which is, or is not to be used, specify the hours during which the works may be carried out, specify the noise level which may be emitted from any specified plant or machinery or may be so emitted during specified hours, and may provide for any change of circumstances. This is an extremely far reaching and important power and one which will require very close liaison between the officers of Planning and Technical Officers departments and those of the Environmental Health Departments, if it is to be effective. Needless to say such a provision carries with it a right of appeal which is to a Magistrates Court within twenty-one days from the service of the notice. Section 57 of the Act gives a right to a person who intends to carry out works to which Section 56 applies, to apply to the Local Authority for a consent. The application must contain particulars of the works to be carried out, the methods by which they are to be carried out and the steps which are proposed to be taken to minimise noise resulting from the works. Such an application would have the merit of bringing both sides together before works are carried out and probably go a long way to obviate the creation of noise nuisance. Sub-section 9 provides however that a consent given under this section shall contain a statement to the effect that the consent does not of itself constitute any ground of defence against any proceedings instituted under Section 54 of the Act i.e. by the occupier of the premises. Section 58 re-enacts previous bye-law provisions with minor amendments in relation to noise in streets, while Section 59 introduces the new and important provisions which arise out of the report on neighbourhood noise, and relate to the designation of noise abatement zones. By this section the Local Authority is empowered by an order confirmed by the Secretary of State to designate all or any part of its area a noise abatement zone. The order must specify the classes of premises to which it applies and the procedure for the confirmation and coming into operation of orders is set out in Schedule One of the Act. Having made noise abatement zones, the Authority is then required to measure the level of noise emanating from premises within the zone which are of

any class to which the relevant Noise Abatement Order relates. It is further required to record all measurements taken in pursuance of this procedure in a register to be referred to as a Noise Level Register to be kept by the Local Authority for the purpose. On recording any measurement in the Noise Level Register it is required to serve a copy of that record on the owner and occupier of the premises of which the measurement was taken. Such a person may, within twenty-eight days of the date of the service appeal to the Secretary of State against the record. Unless such an appeal has been made it is not possible subsequently to question the validity or accuracy of any entry in a noise level register in proceedings taken under the Act. The Noise Level Register must be open to public inspection at the principal office of the Local Authority free of charge at all reasonable hours and the Authority must afford members of the public reasonable facilities for obtaining from the Authority copies of the entries upon payment of reasonable charges. Provision may be made by regulations for determining or for authorising the Secretary of State to determine, the methods by which noise levels are to be determined for the purpose of this Act. Again therefore we are in the position that once the date of coming into operation of the Act is known, we shall not be able to proceed very far unless regulations are made concurrently with the date of coming into operation of the Act. Once noise levels have been recorded in the Noise Level Register in relation to any particular premises, it is an offence to exceed those levels except with a consent in writing of the Local Authority. Such a consent may be made subject to conditions in relation to the amount by which the level of noise may be increased or the period or periods during which the level may be increased. Particulars of a consent given must be entered in the Noise Level Register. If it appears to a Local Authority that the level of noise emanating from any premises in a noise abatement zone is not acceptable, having regard to the purpose for which the noise abatement order was made, and that a reduction in the level is practicable at reasonable cost, and would afford a public benefit, the Local Authority may serve a notice on the person responsible requiring a reduction in the level of noise emanating from the premises to such a level as may be specified in the notice and to prevent any subsequent increase in the level of noise without the consent of the local Authority. Power is also given to a Local Authority to determine acceptable levels of noise in relation to buildings that are to be constructed in areas subject to Noise Abatement Orders. The Act also contains provisions in relation to noise from plant and machinery. The Secretary of State is empowered to make regulations requiring the use in connection with any plant or machinery of devices or arrangements for reducing the noise caused by it, and also for limiting the level of noise which may be caused by any plant or machinery when used for works to which the provisions of Section 56 apply. The Secretary of State is also empowered to prepare, approve and issue Codes of Practice giving guidance on appropriate methods including the use of specified types of plant or machinery for minimising noise. Such Codes of Practice should be of inestimable value to Local Authorities and to those responsible for carrying out works of construction as set out in Section 56 of the Act. This talk is not intended in any way to be an exhaustive treatise on the provisions of the Control of Pollution Act, what I have tried to do is to highlight some of the new and important provisions which will affect some of the members of this society who are engaged in environmental health work in the Local Government field and some which will also be of interest to industrialists with interests in either waste disposal, air pollution or noise.

# INDUSTRIAL NEWS

## Discharge from Webb Corbett now Crystal Clear

The Plastic Constructions Group have recently completed the installation of a fume scrubbing and extraction system at the crystal glass manufacturers, Webb Corbett Ltd.



Designed by the specialist engineers of the Plastic Constructions Group to extract and scrub hydrofluoric acid fumes from the polishing and cullett cleaning shops the system is entirely constructed in rigid p.v.c., suitably reinforced where necessary with glass fibre laminate.

The corrosion-resistant qualities of p.v.c. make it an ideal material for the construction of this type of equipment which includes six catchment trays with lip extract hoods and a p.v.c. floor lining inside the polishing shop. The fume scrubbing and discharge system is installed at the rear

of the works. It comprises of a "2/125 colag" fume scrubbing tower operating at a duty of 24,000 cubic feet per minute and a Placon CTV 1000 belt driven fan unit, also operating at 24,000 cfm at 7in static water gauge, which is powered by a 40 HP motor. A discharge stack with silencer completes the unit which is linked to the extract hoods in the polishing and cullett cleaning shops by interconnecting p.v.c. ductwork.

Reader Enquiry Service No. 7513

## Isotapes keep air analysis probe operational

An air analysis probe, sited some 3,600 metres above sea level at the famous Jungfrau Observatory in Switzerland, has been equipped with Isotape electric heating tapes—made by Isopad Ltd., Borehamwood—to prevent condensation and ice forming in the probe's interior and ensure that it works at maximum efficiency.

The probe forms part of a research project, set up to measure and analyse air impurities at different spots throughout Europe between the Alps and the Arctic Circle. It was built by the engineering firm Schilling Dubendorf, Switzerland, for the Swiss Federal Laboratories for Testing Materials and Research (EMPA).

It consists basically of a vertical suction pipe 5.1m high and 89mm in diameter which takes in air at the rate of 150m<sup>3</sup>/h from the surrounding atmosphere where air temperature can be as low as minus 40-50 degrees C and wind velocity can reach 200 km/h.

The Isopad equipment had to be constructed for maximum robustness and reliability to withstand these conditions without the need for serious maintenance, which would not only mean putting the probe out of action but also an expensive helicopter trip to transfer the equipment to a lower level for repair.



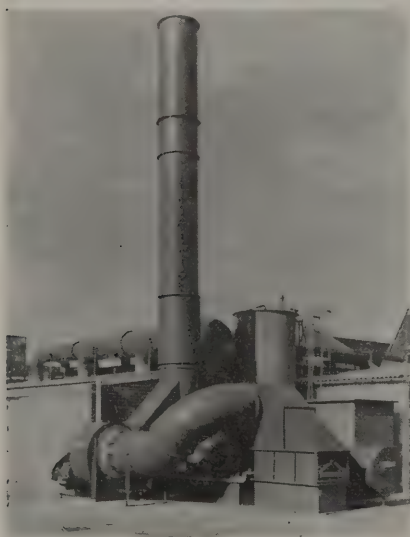
Isopad type FTS/SS 'Isotapes' are used to provide the necessary heat, split into three separate zones with a total loading of 4.4kW: the top 700mm of the probe pipe is spirally wound with 4m of tape with a loading of 1,000W, and the remaining 4.4m of the pipe is divided into two equal heating zones each wound with 4.6m of tape and each rated at 1,700W. Operational voltage is 220V.

The tapes are then thermally insulated with about 100mm thickness of glass wool and an outer metal pipe of 300mm diameter gives final protection and reinforcement against the wind. Power input is controlled by an electronic thyristor system reacting on the air temperature at the suction side of the probe's fan.

Reader Enquiry Service No. 7514

## Ferranti Developing Commercial Terrestrial Solar Cells

The recent staggering increases in the cost of hydrocarbon-derived power have produced much discussion and argument about alternative sources of energy. The 'space race' has promoted the development of one possible alternative: the solar cell. Solar cells are semi-conductor photovoltaic devices that convert sun light



directly into electrical energy. Developments have led to two distinct and reliable types: thin-film cadmium sulphide types (as used in many camera light meters) and single crystal silicon types. It is the latter that shows the most commercial promise as an alternative source of electrical energy and the one which the Ferranti Electronic Components Division is currently developing for terrestrial use.

Ferranti Limited has been manufacturing silicon-based solar cells for satellites and aerospace equipment, where high reliability is the prime criterion, for ten years. The wealth of 'know-how' gained from these projects and recently developed low-cost fabrication techniques has now made terrestrial solar cells an economic proposition for less exotic uses. Ferranti Limited's market research has shown that the likely maximum demand is for a panel of cells to be able to re-charge a 12V battery. A panel would typically supply some 250mA in bright sunlight conditions and measure 12 x 10 inches. Greater capacity can be achieved by simply connecting more panels together. Typical applications for a panel of this size would be boats and caravans, remote area repeater stations, hazard signs, meteorology and hydrology stations, pipe line cathodic protection and many more.

With sufficient demand, Ferranti quote the likely selling price of the above-mentioned panel as around £100. However, they only see this figure as a starting point and that £10 per packaged watt could become economically feasible in three or four years time (in the example the cost per watt is around £30).

It is estimated that a typical solar panel operating in the U.K. will give about twenty watt-hours of output per week. This is sufficient electrical energy to provide a useful source of stand-by power in non-consumer and therefore more demanding situations. Examples of these are remote and inaccessible instrumentation systems, navigation lights and telecommunication links. Therefore, the terrestrial solar cell offers not just free electricity but also a highly reliable and almost inexhaustible energy source.

The critical factor in most solar cell applications is cost. If the cost can be brought down to an acceptable level the commercial future of the solar cell is secure. With improving fabrication technologies—often derived from electronic microcircuit techniques—and reducing prices caused by increasing demand,

Ferranti feel the future of the terrestrial solar cell is assured. Currently the Company's Electronic Components Division is expanding production facilities to meet future demand. Moreover, Ferranti foresee the day when solar cells will be available in sheet form, allowing purchase by the yard.

Reader Enquiry Service No. 7515

### Hydrogen Sulphide Removal Plant for BSC Redcar Development Project

W. C. Holmes & Co. Ltd. are to act as the major sub-contractor to Woodall-Duckham Ltd., for the design and construction of a hydrogen sulphide removal plant at the British Steel Corporation's Redcar Development Project.

The plant comprises a hydrogen cyanide removal section followed by the Holmes-Stretford Process in which hydrogen sulphide is removed and converted to pure molten sulphur. The effluent from these processes will be handled in plant to be built and engineered by Woodall-Duckham. The complete plant is to be incorporated in a new coke oven by-product plant currently being built by Woodall-Duckham.

The Holmes plant is designed to treat 45 million cubic feet of coke oven gas per day, and is the largest single stream installation of its type to be ordered so far.

Reader Enquiry Service No. 7516

### Bostik for the Quiet Life

Bostik Sound Deadener Pads can help to quieten the volume of sound created in heavy traffic areas, by reducing metal vibration. A strip of the bitumen-based sheeting fitted to the



underneath of a car bonnet, the floor areas, and metal surfaces in the boot or door panels will immediately dampen the amount of noise created when the car is in motion.

The Sound-Deadener Pads can be cut to any desired size, can be easily

moulded to the required shape and are free from the flammable vapours often associated with sound deadening compound. They are also clean to use, each strip being coated with a pressure sensitive adhesive and protected by a 'peel-off' backing sheet.

The photograph shows the application of Bostik Sound Deadener Pads to the inside panels of a car bonnet. These pads will effectively reduce noise caused by metal vibration when the car is in motion.

Reader Enquiry Service No. 7517

### Atmospheric Pollution—Effective New British Counter Measure

Advanced mass-flow metering equipment in production by Agar Instrumentation Ltd at Alresford, Hampshire, provides a simple and effective new means of measuring total sulphur dioxide emission. Measurement is an essential prerequisite to the adoption of expensive pollution control techniques; and subsequently of ensuring that anti-pollution regulations are not infringed.

The Agar flowmeter is a solid state, stainless steel probe of 1 in. diameter, inserted direct into the gas flow through the side of the stack. It has a flow range of 50:1 and is highly resistant to corrosion and soot accretion, which have been among the main problems preventing the development of earlier instruments in this field. It has been successfully installed by the Japan Synthetic Rubber Company at Chiba, Japan, and is in production for ICI, Conoco, Esso, Fawley and Gulf Oil, among other companies.

Reader Enquiry Service No. 7518

### Beckman Microbalances Aid Pollution Monitoring

A specially modified microbalance from Beckman RIIC Limited has materially assisted the British Steel Corporation in the monitoring of air pollutants associated with their operations.

In order to ensure that the highest possible standards of air purity are maintained in their employees working environments, the Corporation uses 'personal samplers' to collect samples in normal working conditions. These consist of a small pump attached to the waistband with an extension tube which draws air through a filter at lapel height, near the worker's nostrils.

Subsequently, any solid particulate matter which happens to be present

is trapped on the filter which is carefully weighed before and after use. The filters used are of sintered silver—this material is used because, unlike paper or glassfibre, its mass is unaffected by prevailing humidity.

The amounts involved are minute because the air throughput is only two litres/minute and thus an extremely accurate balance is required. Weighing must also be rapid, however, since many samples are taken.

The BSC laboratory doing this work at Port Talbot, Glamorgan, has solved the problem by using a Beckman RIIC LM600 microbalance with tailor-made pans which, at 5 cm diameter, twice the normal size, are large enough to hold the special filters used. The microbalance—which is capable of weighing to 1 microgram—is used in this application with a digital voltmeter which provides a readout to 10 micrograms.

Reader Enquiry Service No. 7519

#### Reduction in the Lead Content of Petrol

As a further step in a progressive reduction in the permitted lead content of petrol, the British Standard concerned—BS 4040: 1971 Petrol (Gasoline) for motor vehicles—was recently amended. The maximum permitted lead content was reduced from 0.64 grams per litre to 0.55 grams per litre, operative from 1 November 1974. This change will affect all the petrol sold in compliance with the standard (ie, that using the "star grading" system) and therefore nearly all the petrol sold in the UK.

This change in the maximum lead content will not reduce the quality of petrol sold to motorists under the BSI star gradings. The companies supplying petrol will continue to ensure that the octane number of petrol supplied under each grading is maintained above the limits specified in BS 4040 by suitable blending of feed stocks.

The amendment was planned for 1 January 1974, but its publication was postponed as a result of the fuel emergency at the end of 1973. It is now being published in accordance with advice received from the Department of Energy that the Government has requested the UK oil industry to operate to the new limit by 1 November 1974.

This is the second in a series of reductions, planned by the Government in consultation with the petroleum and motor industries and announced in a statement by the Secretary of State for the Environment to

the House of Commons (Hansard 1 August 1972) to the effect that he had agreed to phased reductions in permitted lead content of petrol as follows:

To 0.64 g/l by the end of 1972;  
To 0.55 g/l by the end of 1973; and  
To 0.45 g/l by the end of 1975

The final reduction by the end of 1975 may be to the lower limit of 0.40 g/l if agreement is reached in the Council of the EEC on a proposed directive at present under consideration.

Reader Enquiry Service No. 7520

#### Lead in Gas Tester

New Model 1000 Portable Analyser from Delta Scientific gives fast, accurate tests of lead in gasoline.



Unit uses officially approved ASTM procedures, and covers 0.0-0.06 ppm pH range. Outfit is complete with unique pre-calibrated photometer, and all reagents and labware.

Foam-lined case is rugged and practical for use at service stations, distribution centres or anywhere in the field. Weighs only 10 lbs.

Reader Enquiry Service No. 7521

#### Multi-range Automatic DO/BOD/Temp. Analyser

Multiple ranges on Delta Scientific's new Model 2110 enable it to cover all needs for dissolved oxygen, BOD and temperature tests in every type of municipal treatment plant. Its rugged portability and gasketed, splashproof construction also make it ideal outside the lab or plant, in the field for stream and pollution studies.

D.O. ranges from as low as 0.1 ppm full scale, thru 0.2, 0.10, 0.20 and higher, can be covered. Test results are automatically compensated for temperature, altitude, and depth to 300 ft. Salinity compensation covers full span from fresh water to sea water, 0 to 36 PPT. Unit also has recorder outputs for simultaneous DO and temp. traces. Range for temp. is -5 to +50°C.



Instant air-calibration makes the Model 2110 very easy to use. The unbreakable probe and the instrument are unconditionally guaranteed for two years.

Reader Enquiry Service No. 7522

#### Spectrophotometer for Water and Wastes Analysis

Unique, continuous-wavelength optics and precision-polished absorption cell in Delta Scientific's new Model 2260 Spectrophotometer, permit accurate and reproducible tests of water, wastes and industrial process fluids.

Complete range from 400 to 700 nm enable it to be readily used with all officially approved "Standard Methods" published by WPCA, EPA, etc.



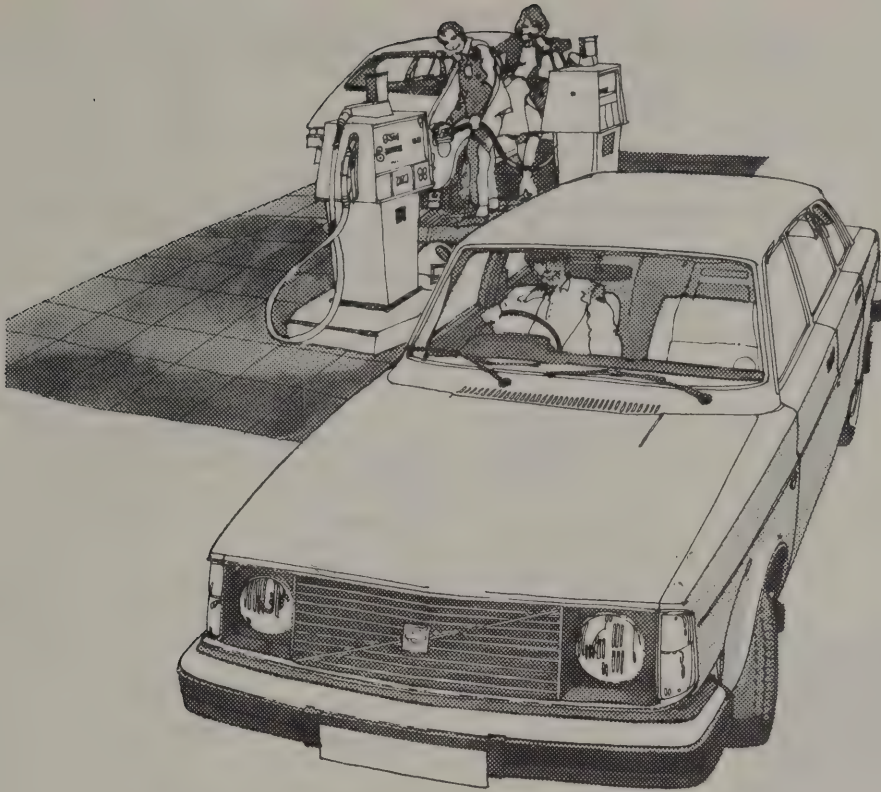
A special power-cell operates the Model 2260 from line power anywhere in the plant or lab (even during brownouts), as well as without power, in the field. Large 8-inch meter has  $\pm 1$  per cent accuracy. Single control knob assures easy operation. Optional 180-page Handbook covers over 60 tests from Acidity to Zinc.

Reader Enquiry Service No. 7523

#### New Clemco Wet Blasting Facility

An improved version of the Kleen Blast water injection unit for wet abrasive blast cleaning has been introduced by Hodge Clemco Ltd. This unit has been designed for compactness and ease of operation and offers users distinct operating advantages.

The Kleen Blast system was launched a year ago in answer to the demand for an effective wet blast



## A Volvo never had looks like this before.

The new Volvo 244 is, in many ways, just like its predecessor, the 144.

It's utterly reliable, safe, durable, and comfortable. But in many respects, it's quite different.

For a start, it's nice to look at.

Then, it boasts a new 2.1 litre engine with an aluminium head and overhead camshaft.

Not surprisingly, it's got a sportier feel. Even though it's designed to run on two-star petrol.

It has slim, contoured seats that would grace a living room.

It has new front suspension and steering making travelling and roadholding exceptionally good.

It has even more safety devices.

Like an invention of ours called a stepped-bore master cylinder.

It simply sees to it you don't have to push the brake pedal harder if one circuit fails.

It's well worth the £2494 we're asking for it.

And it's well worth a visit to our showroom. Come in and give it a look.

### The new Volvo 244.

Volvo have always had an eye firmly fixed on the way their cars behave within the environment and it is worth noting a few of the features that Volvo have introduced over the years:-

- 1949 All models fitted laminated front screen as standard
- 1959 All models fitted front seat belts as standard
- 1966 All models fitted collapsible steering column
- 1969 All models fitted emission control as standard
- 1974 All models fitted energy absorbing front and rear bumpers
- 1975 All models built to meet 1980 Swedish noise limits (76 decibels)

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Reader Enquiry Service No. 7524

cleaning unit for the cleaning of building exteriors. Since then intensive investigation of wet blast cleaning of steel surfaces has resulted in the introduction of the Kleen Blast Mark II unit with cleaning rates equal to those achieved by dry blast cleaning.

The inherent advantage of wet blast cleaning lies in its ability to lay dust and prevent atmospheric pollution. But water under pressure also provides an additional cleaning action; and it removes ingrained salts and chemical residues from the blast-cleaned surface. This is often an important factor in preparing steel surfaces for coating. Furthermore, when rust inhibitors are specified they can be mixed with the water supply.



The Kleen Blast system is based on the established Clemco principle of injecting water into the blast hose at the base of the blast cleaning machine and at a marginally higher pressure than the air/abrasive stream pressure. The unit ensures a stable pressure at the nozzle and a better balanced mixture of air, abrasive and water for maximum cleaning effect. Atomisation of water within the blast hose provides better control than other earlier wet blast cleaning methods and damps all abrasive passing to the nozzle, so eliminating completely the problem of dust—a problem long associated with dry blast cleaning.

Versatility is a feature of the new unit. Operators can switch from wet to dry, or dry to wet, blasting by simply flicking a switch or may shut off the abrasive metering valve and use water only. The unit moreover

may be operated from domestic, mains or static water supplies with or without the addition of a rust inhibitor.

Other features include water injection under controlled pressure without reduction in nozzle velocity (which is achieved by virtue of the mechanical advantage of the special pump) and reduction of water volume to an absolute minimum (which is achieved by means of a fine control valve).

The Kleen Blast Mark II is a complete self-contained unit. No extra lines or attachments running to the nozzle are needed and therefore there is no extra weight for the operator to carry. No additional air supply—or other form of power—is required.

Reader Enquiry Service No. 7525

### Scots are First to Use Coal-based "Natural Gas"

Scottish gas consumers in parts of Fife, Kinross, Perthshire and Angus are the first in the world to use a substitute natural gas made from coal. The area which is being supplied was recently converted to natural gas.

The new gas, which to customers is indistinguishable from natural gas, comes from Scottish Gas's Westfield works. With the introduction of natural gas to the area, the works ceased operations as a town's gas production centre. Because of its unique facilities, it has become the Westfield Development Centre devoted to advanced work on the technology of "converting" coal into gas.

The substitute natural gas that housewives are using comes from a methanation plant at the works. This takes low-heating-value gas made from coal and turns it into a gas principally composed of methane, which has a high heating value and is the major constituent of natural gas. The methanation plant was built to demonstrate the feasibility of the process on a commercial scale.

The project has been sponsored by a group of United States companies headed by the Continental Oil Company of Ponca City, Oklahoma. Many representatives of fuel corporations, gas utilities and other American and foreign organisations have visited the plant over the past 12 months.

This project has been valuable in providing support for several plans to

build plants, based on the Westfield model, in America to supplement declining natural gas reserves there and exploit vast reserves of relatively cheap coal. Two of the most advanced projects are both now awaiting planning permission and would be situated in New Mexico. Each would produce 250 million cubic feet of gas a day—enough to supply the whole of Scotland for one day in mid-winter.

The methanation project at Westfield is due to be concluded later this year. Meantime, it was decided to make use of the product gas to augment normal North Sea gas supplies. Before the gas was distributed to customers, extensive tests on a scientific basis and under domestic conditions were carried out to make absolutely sure that the working of appliances would not be affected. To housewives there is no difference between the substitute natural gas and "conventional" natural gas, and no "reconversion" of appliances is involved.

The Westfield methanation plant, which can produce two and a half million cubic feet a day, is only one of the US-sponsored projects now in hand there. Another is just being concluded. In it four different kinds of American coal have been tested to see if they can be turned into gas in the type of gasifiers used at Westfield. This project was sponsored by the American Gas Association.

A new Westfield project, with \$10 million sponsorship from another group of US organisations, is to develop to commercial scale a different kind of coal gasifier. It is using a process which was developed and taken to pilot plant stage at the British Gas Corporation's Midlands Research Station in Solihull, Warwickshire. Known as the slagging gasifier, the process employs higher temperatures than in the process already described.

This project will run for about three years to demonstrate to the world—and particularly the United States—the technical and commercial viability of the process. British Gas will receive royalties from the sale of the process. In addition it will gain the experience of building and operating this kind of plant.

British Gas, however, has no plans for using coal gasification. It regards the development work as an insurance policy should Britain's own natural gas resources need to be supplemented.

Reader Enquiry Service No. 7526

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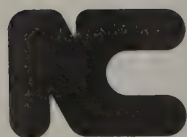
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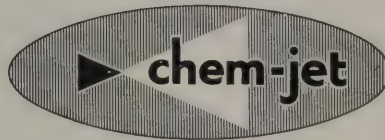
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